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Assembling Department in a Modern Plant Wherein an Efficient System of General Lighting Provides Excellently Distributed Illumination of Ample Intensity to Dispense With Local Lights.

Better Lighting of Iron and Steel Mills and Fabricating Plants

Important Work of the Industry During War—Day and Night Operation Emphasizes Value of Improved Lighting—Features in Which Lighting Betterment Can Be Extended

By F. H. BERNHARD

This is the eleventh of a series of twelve articles on improvement in lighting in as many different industries. These articles emphasize the desirability of improving industrial lighting to meet present abnormal conditions and those that may come in the near future. The advantages of better lighting are presented in a non-technical way so that they may readily be brought to the attention of factory owners, managers and superintendents, many of whom have only an imperfect realization of the relation of good lighting to their industries.

The iron and steel industry, with its numerous branches making distinctively iron and steel products, is the leading manufacturing industry of the country as regards value of output. It is also one of the most progressive. Making steady strides in development for many decades, it received an extraordinary impetus during the World War through its production of the varied munitions and other supplies that helped so largely in winning the war. The strenuous period just closing is one of historic achievement in this industry, achievement brought about by concentrated and coordinated effort in meeting the nation's imperative demands.

To do this has required accelerated mining and transportation of ore, fuel and flux to the blast furnaces, and continuous operation day and night to an extent heretofore unknown of blast furnaces, open-hearth furnaces, Bessemer converters, electric steel furnaces, rolling mills of every description, and finishing plants (including assembling works, foundries, forge shops, machine shops, etc.) wherein the metal is fabricated into the completed article. Naturally,

to secure day and night operation without interruption and at a maximum efficiency has required increased attention to the subject of plant lighting and considerable progress has been made in this line, both as to

Stock Room of a Steel Plant—High-Power Mazda Lamps With Enameled Steel Reflectors Provide a Flood of Well Distributed Light Throughout the Room.

natural and artificial lighting. That there is still room for much further progress will be pointed out in this article, which will concern itself in a general way with the lighting of iron and steel mills, and of such plants as steel jobbing houses, bridge works, foundries and forge shops, where the steel and iron is further prepared for use by the builder or contractor, or the manufacturer of the machinery, hardware, tools, etc., that represent the finished product.

Operating and Lighting Conditions in the Industry.

Continuous operation night and day was first applied to blast furnaces and then extended to open hearths, converters and certain of the rolling mills. In some of the processes continuous running was absolutely essential and in others it became more and more advisable as a matter of economy of operation and efficient utilization of heavy plant investment. Enormous buildings with their expensive equipment of rolls and auxiliary machinery could not be left standing idle something like two-thirds of the time, so that to keep down the proportion of the fixed charges to the total production cost it was felt expedient to operate with two shifts and later even with three shifts per 24-hour day. This incidentally increased the capacity of rolling mills to double or triple the former value and obviated or deferred the raising of additional capital for extensions of these parts of the plant. Moreover, it increased the plant efficiency by reducing the fuel needed for soaking pits and reheating furnaces, since the ingots were kept in them a minimum length of time.

All told, continuous operation had already made the iron and steel industry capable of operating at very high efficiency and large capacity when it was called upon to meet suddenly and greatly increased demands due to the war. The dependable and otherwise satisfactory manner in which the iron and steel was produced as needed was made possible in no small degree by the preparation of the industry for operating as well by night as by day and this, of course, by having given at least a fair amount of attention to lighting, at least to the extent of having a general lighting system for the interiors of nearly all plant buildings and for the principal trackage, roadways and paths in the yards.

In the accessory or fabricating plants night operation was by no means so common before the war, in fact, in many it was almost unknown except that occasional overtime work was resorted to during a period of special rush. Consequently, the lighting to be found in foundries and forge shops doing a jobbing business, for instance, was generally quite inferior. During the war this has been improved in some cases, but not to the extent desirable. In the case of foundries and forge shops connected with large manufacturing plants, especially those engaged on munition work, the conditions are much better in this respect. More night and overtime work has been the case here and lighting has necessarily been given greater consideration.

Our entrance into the war acted as a decided stimulus to protective lighting, especially around the plant. The action of enemy agents in destroying or attempting to destroy plant buildings or equipment called for effective assistance to the watchmen guarding the premises by night. This led to extensive use of flood lighting and similar means of illuminating the approaches and boundaries of plants engaged on war work. Such lighting also was found effective when applied to general yard lighting. It is likely that the low cost of such yard lighting will cause it to be retained as a permanent means of bettering the exterior lighting conditions.

However, throughout the industry considered, both in iron and steel mills proper and in what may be called fabricating plants, the importance of having plenty of light is not fully recognized, that is, the intensity of the artificial lighting furnished is generally too low. An attempt is usually made to supply general illumination from high-hung lamps and localized light-

Foundry in Which Overhead General Lighting Provides a Liberal, But Not Excessive, Illumination for Floor Molding.

ing is used to only a limited extent. Not only is the illumination intensity not what it should be in most cases, but the spacing of units is usually too great so that the light distribution is not as uniform as would be desirable, the shadows from parts of machinery and

Foundry on the Second Floor of a Large Plant—General Lighting for Casting Floor and Combined General and Local Lighting for Molding Machines and Benches—Note That All Local Lights Are Provided With Deep Reflectors to Screen the Direct Light from Molders' Eyes.

from stacked up material, molds, etc., are also therefore too dense.

The substance of the matter is that these mills and plants are not to be compared in their lighting as a whole with those further and highly developed branches of the iron and steel industry that work up the metal into machinery, automobiles, etc., that is, which include chiefly machine shops and the like where the more accurate machining, assembling and finishing operations are performed. The lighting conditions in these finishing shops have already been discussed in two other articles of this series: "Better Lighting of Machine Shops," ELECTRICAL REVIEW of June 1, 1918, and "Improved Lighting of Automobile Manufacturing Plants," ELECTRICAL REVIEW, August 10, 1918, so that there is no need to review the lighting in these latter plants. By contrast, however, the smelting and rolling mills and rough fabricating plants have not developed their lighting to anywhere near as high a point as the more progressive machine and finishing shops. Although their requirements are not so exacting, they suffer from certain disadvantages on this account that will be pointed out further on.

To understand the reason for the prevailing lighting practice in steel mills and fabricating plants it is necessary to go back to the lighting conditions of only some ten or less years ago. Arc lamps constituted the chief source of illumination; in many cases these were of the flame type, but in all cases they represented a considerable initial investment and a rather high maintenance cost. Consequently it was desirable to keep down the number of units, so that wide spacing was the natural result. Few industrial plant managers or superintendents had any conception of the value of adequate and evenly distributed illumination. When these arcs came to be replaced with tungsten-filament incandescent lamps the same outlets were generally used and the intensity was not greatly increased. Lighting conditions were improved because of the much steadier and more reliable light, and the operating and maintenance costs were usually reduced. Had larger or more units been used when the change was made the illumination would have been decidedly increased at relatively small or no increase in cost.

It is not to be inferred from the fact that natural lighting conditions have not been referred to much that these are by any means perfect. They are indeed far from it in most plants. Although in many cases mill buildings have large sections of their sides open, the window surface left in the other sides is generally

Punch Press Room in Which a Good Overhead Lighting System Facilitates the Work and Reduces Accidents That Usually Are So Numerous in This Work.

rather small and the panes are nearly always covered with dust and dirt, being cleaned as a rule only by an occasional rain. Not only is the daylight in many parts of the buildings therefore inadequate even at midday, but it is rather poorly distributed, not so well distributed in fact as the artificial lighting furnished when all lamps are turned on at nightfall.

Lighting Requirements of the Industry.

As a rule, the buildings of the steel industry, as well as of bridge works, forge shops and foundries, are high and long, covering a considerable ground area. The roofs are commonly of the steel-truss-supported type with monitors at the top for ventilation and admission of a certain amount of daylight. The height combined with the length is especially suitable for the operation of traveling cranes for moving ingots, ladles, molds, heavy forged pieces, machine parts, etc. There is usually more or less vapor developed in the buildings from contact of the hot metal with water or from the water jackets of furnaces and bearings; gas escaping from furnaces, converters, soaking pits, ovens, etc., is also commonly present. Ore and fuel dust as well as common smoke and finely divided oxide scale are usually carried in the air currents. These are some of the physical conditions that affect the lighting requirements and which must be taken into consideration in deciding on the kind of lighting system to use, how it is to be installed and maintained.

As to the character of the work, for the most part it is relatively rough; much of it is very rough indeed, as furnace charging, casting of pig iron, rolling of billets, rails, heavy beams and other structural shapes.

Machine Shop of a Foundry Company Whose Lighting Has Been Modernized by Use of an Efficient System of Mazda Lamps and Glare-Free Reflectors.

Wire drawing and foundry work on small pieces are examples of work requiring more care and refinement, although even here the visual requirements are by no means as exacting as in the case of machine shops engaged on anything but the roughest machining.

From this it may be inferred that a low intensity of illumination will suffice, just enough to get around the plant without trouble and take care of the heavy, rough work to be done. However, it must be remembered that this industry has a very high accident record. This has stimulated very active "Safety First" measures in iron and steel plants, which have lowered the accident numbers, but still leave much to be desired in this line. The lighting must therefore fully expose all dangerous places; this includes elimination of dark shadows in and about the plant as well as such an intensity of illumination, in all aisles, walks, etc., as will be ample for safety. The outside yards must also be well lighted because they are the scene of a great increase of accidents by night as compared with day.

Another fact to be noted is that the interior and exterior surfaces are usually very dark, due to the black dust already referred to. This applies not only to floors, but also to walls and ceilings. Proper illumination with such poor reflecting surfaces calls for much higher power in the light sources than is needed to secure equal illumination intensity where walls, ceilings and floors are of light color. The dust, smoke and vapor also quickly soils lamps and reflectors, so that unless unusually frequent cleaning is done, the illumination rapidly deteriorates. All these facts call for more light than is usually provided, as well as attention to its effective distribution and efficient maintenance. The lighting units, moreover, must be installed so that they do not interfere with the operation of traveling cranes, nor the cranes interfere with their usefulness.

Advantages Resulting from Improved Lighting.

Assuming that a lighting system which shall satisfy the foregoing requirements is considered, that is, one which is superior to prevailing systems in steel mills and the like, in intensity and distribution of the illumination, at least, the question may arise as to what advantages such a system has to offset its cost. Such a system should have practically the same advantages found in substantially all industrial plants that have rehabilitated their lighting to conform to modern, scientific lighting practice. These are, briefly: Decreased accidents, increased production, improved quality of product and reduced spoilage, decreased eye strain, improved supervision, more orderly kept plant, more cheerful and better working conditions, greater contentment of the workmen. Some of these advantages need little or no comment, being evident to any observant superintendent or manager from a comparison of the work done and conduct of the men by night contrasted with a bright day. Others are worthy of brief emphasis.

Take the matter of accidents, for instance. In spite of highly developed safety work in the larger plants, it is found that accidents are still more numerous by night than by day. This is due chiefly to relative inferiority of the artificial light used as compared with good daylight. The accident diagram of a large steel plant showed this clearly. The accident rates were reduced to a basis of 1000 workmen employed 300 days per year. In the case of miscellaneous machinery accidents and those occurring in the yards, the night rate is over twice the day rate. In the other principal departments, aside from the blast furnaces, it is from about 25 to 35% greater at night than by day. This increase of night accidents is not unavoidable; it can be substantially reduced or even eliminated by decidedly improving the lighting. The safety work already done shows that accident prevention pays in every way from the employer's pecuniary viewpoint, as well as from the larger humanitarian considerations that take account of the employe and his family. A few years ago it was regarded as inherent in the industry that it must have such a serious accident record; safety measures were little known and much more was spent for hospital and medical care than for preventive means. This has been largely changed, but no steel works official will assert that the reasonable limit in accident prevention has been reached. Other indus-

tries have clearly demonstrated good lighting to be a most effective and economical accident preventive and this has been verified in many of the large iron and steel works that have modernized their lighting as a war measure.

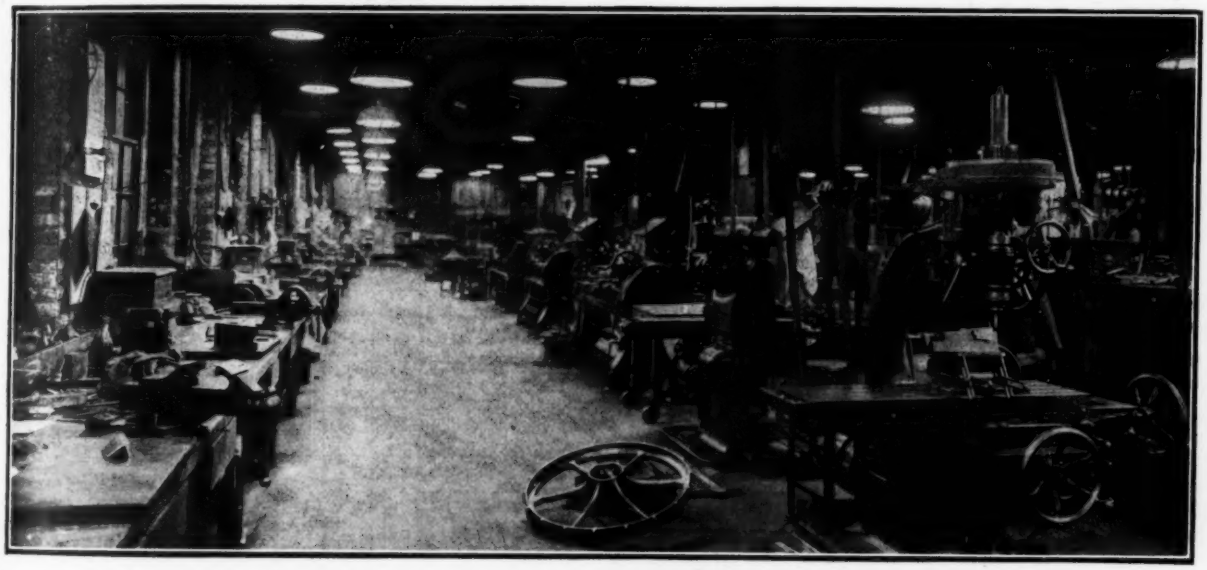
Quality of a steel rail, bar, beam or forging, or of an iron or steel casting depends in no small measure upon the way that the roll operator, inspector, drop forger or molder could observe his work while he was doing it, that is, upon the light that fell on the work. If that light was too meager or misdirected, he probably could not detect flaws that would have been evident by proper light. In the case of molding, poor light is responsible for a very large part of inferior castings. Few foundries have abundant light, but those that do, like the ones shown in some of the accompanying illustrations, have found a marked improvement in the quality of the castings produced and reduction in the rejections.

A plant that is well lighted makes supervision very much easier. The foreman or mill boss can see any part of his department and observe not only whether the men are attentive to duty but also whether the machinery is working properly. Symptoms of abnormal operation can be quickly detected and the oncoming trouble and interruption reduced in severity or entirely obviated. Thus the loafing time, both of the men and machines, may be materially reduced and production kept up to capacity rate.

In other ways also good lighting has been frequently found to stimulate production. If it is not through elimination of time losses, it is through accelerated application of the workmen, often unconsciously brought about by stimulating the alertness and activity or in otherwise increasing the all-around working efficiency of the employe. In one plant production increases of 8 to 27% were found on careful test after the lighting had been increased to about triple its former intensity. A very substantial increase is to be expected in almost every plant, which represents a vital advantage obtained in times of labor shortage and inflated wages like the present and also obtained at low cost, considering the fact that it is but one of the advantages of improved lighting.

True improvement in lighting always means diminished eye strain of the workmen. This may be due to the higher intensity of the light or to the absence of glare or great brightness contrasts, or to steadier light; all of these may be involved more or less. At any rate, diminished eye strain is one of the factors that greatly affect the efficiency of the employe by relieving his fatigue, making him more cheerful and more contented. Again, in times of labor shortage these factors must be taken into careful consideration if excessive labor turnover, always rather high in this industry, is to be prevented.

In the way of suggestions for lighting betterment, space permits mention of only a few ideas. One is the need for higher intensities of illumination for the reasons already pointed out. Another is the importance of much better yard lighting, for which flood-lighting projectors are now quite commonly used with efficient results. Stairways, passageways and aisles should also receive much more care in lighting than is now customary. There are almost no departments of steel works and most fabricating plants that do not call for material increase of light. The reason that the accompanying illustrations do not show first-class examples of the best lighting practice in iron and steel works is that there are relatively so few cases where the development has been carried far enough. In the views shown in portions of related plants the intensity and uniformity of the illumination has been brought up to the standard that it is hoped will before long be commonly used in steel works. Another point that should be emphasized is the need for efficient and durable reflectors. Cheap equipment in this line is a waste of money. Porcelain enamel heavily applied protects the steel body of the reflector and makes a reflecting surface that is efficient and easily cleaned. Cleaning cannot be done often enough if lighting efficiency is to be maintained at anywhere near the maximum possible. It should be remembered that dirty lamps and reflectors may represent a loss of half the light. Accessibility for frequent cleaning should be provided by mounting the units on hangers permitting easy lowering, or else just above the traveling crane so they may be reached therefrom easily and safely.



Example of How General Lighting Can Be Modified by Staggering the Units so as to Obtain Light from Two Directions for Bench Work—This Idea Is Applicable to Fine Bench Molding in a Foundry.

Coal Consumption Rates in Various Central Stations and Industrial Plants

Result of Study by Hydro-Electric Commission of Ontario Proves Superiority of Large Power Plant and Emphasizes Economy of High Load-Factor

The Coal Conservation Committee of the Reconstruction Committee of Great Britain presented an interim report on "Electric Power Supply in Great Britain" on April 17, 1917. This was made available to the public in December, 1917, an abstract of which appeared in the ELECTRICAL REVIEW of February 9, 1918. This report served to emphasize the enormous waste of coal which takes place when it is burned in small, isolated plants instead of in large central stations; and the great advantages resulting from the use of electric energy in industries, in the home and for transportation purposes. The possibilities accruing from dealing with the power supply of the United Kingdom on a comprehensive scale were also covered.

Since the above-mentioned report was made available for public perusal, and because of the incentive it created for saving coal by adoption of interconnection of power plants, use of large instead of small stations, and so forth, the Hydro-Electric Commission of Ontario has issued a report entitled, "The Rate of Coal Consumption in Various Electric Generating Stations and Industrial Establishments in Canada and the United States." This report, an abstract of which follows, brings out forcibly the influence exerted by plant capacity and plant load-factor upon coal consumption.

A circular letter, accompanied by a list of questions covering matters bearing on the subject, was sent to a number of central stations throughout Canada and the United States. As a result of these inquiries particulars were received from 73 stations, 50% of the replies being from representative stations ranging in capacity from 150 kw. to 150,000 kw. and containing all details necessary for the purposes of this research.

These replies have all been carefully tabulated in the accompanying sheets, most of the figures being averages for the past five years, and the average figures for different sizes of stations have been deduced therefrom. Tables divide the various stations into "classes" "A" to "F" inclusive. These are purely arbitrary divisions made for convenience as follows:—

Class A—Includes stations up to 1,000 kw. Capacity.
" B— " " from 1,001 to 5,000 kw. Capacity
" C— " " " 5,001 to 10,000 " "
" D— " " " 10,001 to 50,000 " "
" E— " " " 50,001 to 100,000 " "
" F— " " above 100,000 kw. capacity.

Table I summarizes the average figures for the various "classes" and Table II gives averages for groups of "classes," *e.g.*, the first (horizontal) row of figures gives averages for stations in classes A and B, the second row gives them for classes A, B, and C and so on.

In addition to the tables a curve sheet, Fig. 1, shows the relation of a number of factors to station capacity.

The average figures made use of have therefore been compiled from various stations and cover several years of operation as is shown below:—

Class.	No. of stations.	No. of years operation.	Station years of operation.	Average size of station Kw.
"A"	2	5	14	650
	1	4		
"B"	8	5	47	2980
	1	4		
	1	3		
"C"	7	5	49	7230
	3	4		
	2	1		
"D"	6	5	36	24,600
	2	3		
"E"	1	5	5	96,000
"F"	1	5	5	149,000

Thus the figures are, in effect, based on the operation of the various sizes of stations given in the 5th column

TABLE I.—COAL CONSUMPTION OF CENTRAL STATIONS.

Average Figures (by Slide Rule).

Class.	Station capacity.	Maximum load.	Kw-h. & hp-h. generated.	Kw-y. & hp-y. generated.	% Load factor.	Coal: Lbs. per kw-h. & hp-h.	Coal: Tons per kw-y. & hp-y.	Coal: B.t.u. per kw-h. & hp-h.	Coal: B.t.u. per lb.	Consumption, tons per year (2000 lbs.)	Kw-h. & hp-h. per 100,000 B.t.u.	Eff. %.
A ....Kw.	650	425	1,123,820	128	29.3	7.65	34.60	95,600	12,500	3,930	1.04	3.5
Hp.	870	570	1,500,000	172	....	5.70	25.00	71,400	.....	.....	1.40	....
B ....Kw.	2,980	1,570	4,703,600	538	34.2	4.30	19.00	55,500	12,900	9,230	1.80	6.2
Hp.	4,000	2,100	6,300,000	720	....	3.20	14.00	41,300	.....	.....	2.40	....
C ....Kw.	7,230	3,820	10,422,000	1,190	31.7	4.07	17.80	48,500	11,900	20,200	2.06	7.0
Hp.	9,700	5,100	14,000,000	1,600	....	3.04	13.30	36,200	.....	.....	2.76	....
D ....Kw.	24,600	10,760	33,500,000	3,820	36.0	2.90	12.75	39,600	13,600	48,030	2.50	8.6
Hp.	33,000	14,400	44,900,000	5,120	....	2.17	9.50	29,500	.....	.....	3.40	....
E ....Kw.	96,000	62,060	200,679,750	23,650	36.9	2.00	8.80	28,000	14,000	201,420	3.57	12.1
Hp.	128,800	83,000	276,500,000	31,650	....	1.50	6.57	21,000	.....	.....	4.76	....
F ....Kw.	149,000	92,080	360,218,000	41,000	44.7	1.92	8.40	25,900	13,500	345,580	3.86	13.1
Hp.	199,500	123,200	483,000,000	55,000	....	1.43	6.26	19,300	.....	.....	5.18	....
TABLE II.—AVERAGES OF GROUPS OF CLASSES.												
A & B.Kw.	1,820	1,000	2,913,700	330	31.3	5.97	26.80	75,560	12,800	6,580	1.35	4.8
Hp.	2,440	1,340	3,900,000	440	....	4.45	19.55	56,350	.....	.....	1.77	....
A to C.Kw.	3,620	1,940	5,416,500	620	31.7	5.34	23.80	66,540	12,250	11,120	1.50	5.6
Hp.	4,860	2,600	7,270,000	830	....	3.98	17.47	49,630	.....	.....	2.01	....
A to D.Kw.	8,870	4,150	12,437,300	1,420	32.8	4.73	21.04	59,800	13,100	20,350	1.67	6.3
Hp.	11,890	5,540	16,675,300	1,900	....	3.53	15.48	44,600	.....	.....	2.25	....
A to F.Kw.	46,740	28,440	101,774,500	11,720	35.5	3.81	16.90	48,880	13,600	104,740	2.04	8.4
Hp.	62,650	38,060	137,700,000	15,710	....	2.84	12.46	36,620	.....	.....	2.73	....

of the above table over the periods of time given in the 4th column, and as all the periods of operation are quite recent, it will be seen that the data used constitute a very fair basis to work upon.

Technical Data on Central Stations.

The average of the more important items in the tables referred to for the various "classes" of stations, are as follows:—

Average Figures per "Class."

Class.	Station capacity. Kw.	Hp.	Coal — Lbs. per Kw-h.	Hp-h.	Tons per Kw-y.	Hp-y.	B.t.u. per lb.	Load factor %	Eff. %
A	650	870	7.65	5.70	34.60	25.10	12,500	29.3	3.5
B	2,980	4,000	4.30	3.20	19.00	14.00	12,900	34.2	6.2
C	7,230	9,700	4.07	3.04	17.80	13.30	11,900	31.7	7.0
D	24,600	33,000	2.91	2.17	12.75	9.52	13,600	36.0	6.6
E	96,000	128,800	2.01	1.50	8.80	6.57	14,000	36.9	12.1
F	149,000	199,500	1.92	1.43	8.40	6.26	13,500	44.7	13.1
All classes	46,340	62,600	3.81	2.84	16.90	12.46	13,600	35.5	8.4

In the foregoing table, "efficiency per cent" is the percentage of the efficiency of conversion of heat energy in the coal to electric energy at the switchboard.

The B.t.u. per pound of coal as given in this table have been calculated by taking the B.t.u. for each station, multiplying these values by the average pounds of coal used per annum by each station, and dividing the sum of the products thus obtained by the total pounds of coal used, per annum, by all the stations in the class. The resulting figures, while they approximate those which would be obtained by simply taking the averages of the B.t.u. as the figures stand in the columns, are yet sufficiently different to warrant the employment of the more accurate method.

In making estimates, the use of a coal of higher or lower calorific value per pound in any given station would of course alter the coal consumption per kw-h. in a corresponding manner and it is for this reason that these B.t.u. values have been given.

The figures in Table II will be useful in considering groups of stations, the average capacities of which are of the order of those given in the table; variations of such average capacities from those given may then be allowed for (plus or minus) by consulting Table I, which gives the highest and lowest of the figures from which the averages in Table II have been derived.

Turning to conditions as they exist in Canada, it is found that the average capacities of steam-driven central stations using coal in this country, are approximately as follows:—

	Average.	Total.
Alberta	1,675 kw.	21,775 kw.
British Columbia	960 kw.	6,695 kw.
Manitoba	1,060 kw.	8,455 kw.
New Brunswick	570 kw.	4,520 kw.
Nova Scotia	670 kw.	11,390 kw.
Ontario	135 kw.	4,030 kw.
Prince Edward Island	350 kw.	700 kw.
Quebec	1,570 kw.	17,800 kw.
Saskatchewan	1,870 kw.	16,860 kw.
	8,860 kw.	92,225 kw.
Average	1,000 kw. for all Canada.	

From Table II it will be observed that for stations in capacities up to 1800 kw. the average load-factor is 31.3% so that 30% for a 1000-kw. station will be a fair figure to take in round numbers. The rate of coal consumption of an 1800 kw. station will, as may be seen from the same table, average 20 tons per hp-y. and for a 650-kw. station (see Table I) averages 25 tons per hp-y.—on this basis a 1000-kw. station will

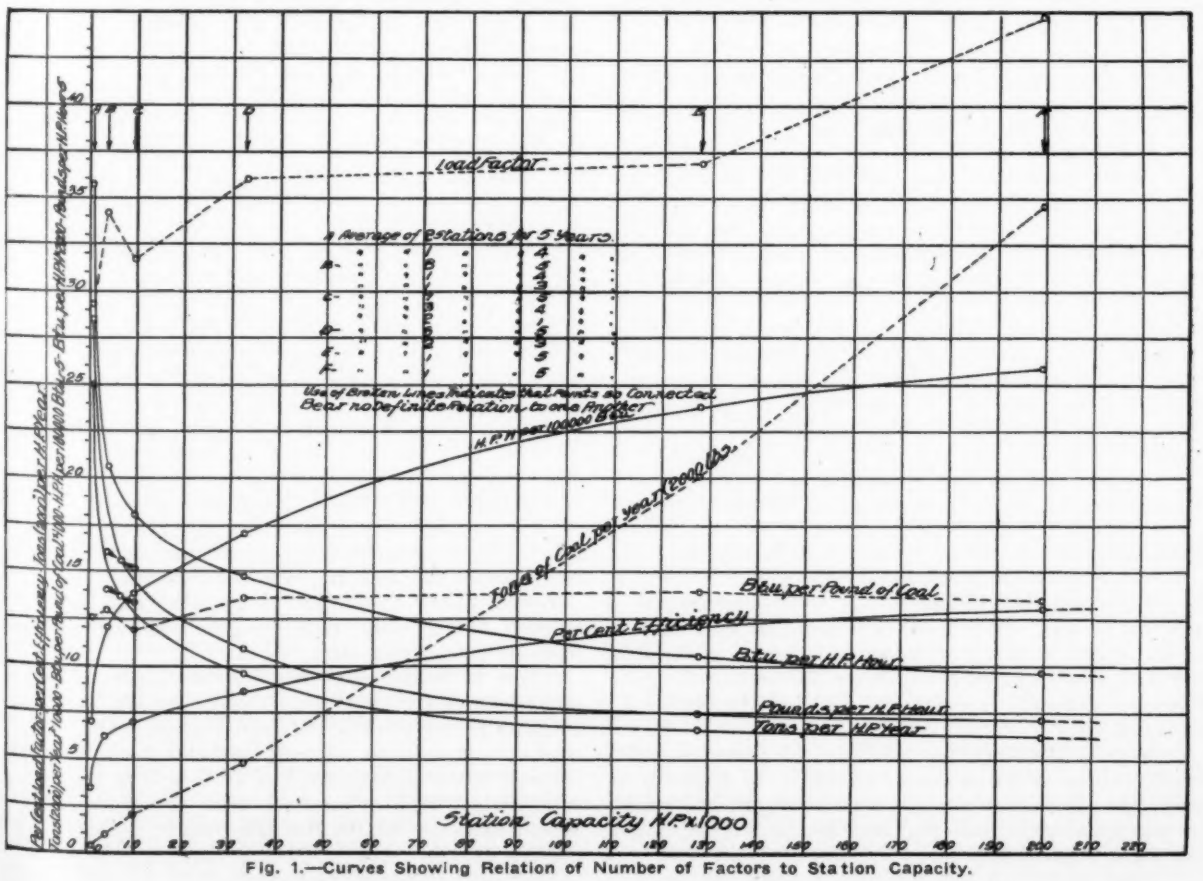

Load Factor
Average of 8 Stations for 5 Years
Use of Broken Lines Indicates that Points so Connected Bear no Definite Relation to one Another
H.P.H. per 100,000 B.t.u.
Tons of Coal per year (2000 lbs.)
B.t.u. per Pound of Coal
Per Cent Efficiency
B.t.u. per H.P. Hour
Pounds per H.P. Hour
Tons per H.P. Year
Station Capacity H.P. x 1000

Fig. 1.—Curves Showing Relation of Number of Factors to Station Capacity.

average a combustion rate of about 23 tons per horse-power-year.

Technical Data on Industrial Plants.

The Hydro-Electric Power Commission of Ontario conducted an investigation last year regarding the industrial steam plants in use in the Niagara District and compiled a list of a large number of these, giving various details respecting them. From this list those plants were chosen which, so far as the records show, use coal exclusively and use it for power only (other plants use large quantities of refuse and some employ steam for heating, etc.); these constituted a large pro-

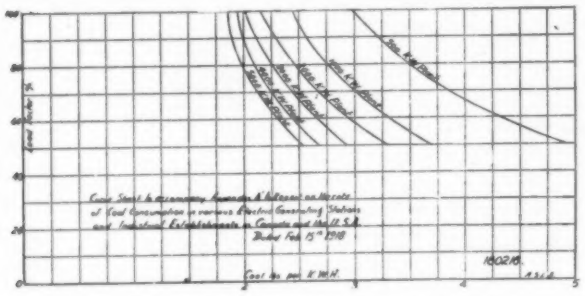


Fig. 2.—Curves from Which Fig. 1 Is Derived.

portion of the total number and amounted to 135 actual plants selected.

Averaging the plant capacities in hp., the tons of coal used per annum, and the number of hours during which the plants operate per day, the following figures were obtained:—

Average of 135 industrial steam plants:—

Horsepower.	Tons coal used per year.	Daily hours of operation.
260	1,830	13.75

The hours of operation are undoubtedly too high for normal times as most factories were working overtime and many operated 24 hours per day.

According to the "Postal Census of Manufacturers" covering the year 1915 (page XIV) "each manufacturing establishment in Canada worked full time 222 days" and a part time for 19 days, "the average shift consists of 9.2 hours." From this it may be assumed that a fair average figure would be $9.2 \times 222 + 5 \times 19 = 2140$ or, say, 2500 hours per annum. At 75% hourly load-factor, a reasonable figure to take for such plants and is the same as that used in the 1903 report of the Ontario Power Commission, the rate of coal consumption per hp-h. works out to $\frac{1830 \times 2000}{260 \times 75/100 \times 2500} = 7.5$ lb. For continuous operation (8760 hours per annum) this is equivalent to $\frac{7.5 \times 8760}{2000} = 33.0$ tons per hp. year—a figure comparable with those in the tables accompanying the present report and represents a yearly load-factor of 28.5%, say 30% in round figures. In Canada the combined capacity of all steam-driven electric generating stations is quite close to 100,000 kw. (134,000 hp.).

On the basis of 33 tons per hp-y. the above quantity would suffice for 210,000 hp. but this is for 8760 hours operation; for an average of 2500 hours the hp. would be $760/2500 \times 210{,}000 = 735{,}000$ hp., or say in round numbers 750,000 hp.

Summary.

For electric generating stations, using coal fired under boilers, such as are in actual operation in Canada and the United States today, the average rates of coal consumption for various sizes of stations are as shown below:

Station capacity, Kw.	Rate of coal consumption, tons per hp-y.
Over 100,000	6.25
50,000 to 100,000	6.57
10,000 to 50,000	9.32
5,000 to 10,000	13.30
1,000 to 5,000	14.00
Under 1,000	25.10 and higher

Now, although it is true that, under very favorable conditions and in plants of the largest sizes, the rate of coal consumption may be as low as 6.25 tons per hp-y., it is equally correct to state that, taking average existing conditions for electric generating stations in Canada, the rate approximates to 23 tons per hp-y., and, for industrial plants, to 33 tons per hp-y., while for these two kinds of plants combined, the average rate is not less than 30 tons per hp-y.

The curve of coal consumption per hp-y. becomes practically horizontal at a station capacity of about 150,000 hp., showing that with present equipment, methods of operation, load-factors, etc., in the large generating stations, the rate of coal consumption can not come below about 6.25 tons per hp-y., no matter how large a station may be. Since equipment now in use is getting near to the maximum possible efficiency this means that probably under no circumstances will it be possible to get below, say, 5.5 tons per hp-y. Centralization on a vast scale may tend to reduce costs but cannot conserve coal very much as compared with existing conditions in the large stations. At the same time it must be remembered that as the coal bill in a central station usually forms from 40 to 60% of the total costs, even comparatively small percentage savings on this item count for a good deal in actual money.

Another point to be observed from the curves is that, comparing stations of say 50,000 and 200,000 hp. capacity respectively, it is found that the rates of coal consumption are 8.6 and 6.26 tons per hp-y., showing a saving of approximately 25% for the larger station; the respective load-factors are, however, 36.2 and 44.7%, respectively. There is no doubt that if the smaller stations were operated at the same load-factor as that obtained in the larger station the difference in the rates of coal consumption would be much smaller than that given above (excluding other disturbing factors such as the use of poor coal), and emphasizes the fact that the very large stations do not tend to make very big reductions in rates of coal consumption as compared with those of more moderate size.

It is evident from these considerations that coal can be better conserved by appreciably increasing the load-factors of existing stations of moderate size (around 50,000 kw. capacity) than by building huge stations having only slightly higher load-factors than those of the smaller sizes.

This is clearly indicated by the curve in Fig. 1, which shows the rate of coal consumption in various sizes of plants at different load-factors. The rate of coal consumption at a given load-factor as the plants become larger is reduced but at a rapidly decreasing rate, and, though the same is true of the rate at different load-factors for the same plant, it is not in so great a degree.

Combustion Characteristics of Coals

Combustion Characteristics of Coals and Their Influence Upon Choice of Stoker Equipment—Load Conditions Also Important Factor

By JOSEPH G. WORKER

Westinghouse & Electric Manufacturing Company.

Many factors enter into the success or failure of equipment selected for burning different kinds of coal. Not long ago careful consideration was given to the available fuels in different markets, and a particular stoking equipment was selected that seemed to be best suited for a particular kind of coal. In these critical times, however, this viewpoint has necessarily been changed, and it is not now a question of choosing a particular kind of coal and then selecting apparatus to burn that fuel, but rather the selection of stoking equipment that will burn a wide range of coals. That is, it is not possible now to choose the coal that will be used for any particular industry, but the equipment must be selected and arranged to burn the coal that can be obtained, irrespective of its quality.

In selecting stoker equipment, four factors should be carefully considered. Surprisingly, the most important of these is not the kind of coal to be burned, but rather the load condition of the plant. These four factors, in the order of their importance, are: (1) Load conditions; (2) available coal; (3) draft conditions; (4) application conditions.

The nature of the load and the amount of coal to be burned by any particular apparatus are most important, for the reason that if certain load conditions dominate, irrespective of everything else, stoking apparatus must be selected for that condition. This is also necessary for the reason that different types of stokers can burn the same kinds of coal, but each type of stoker is limited as to the continuous overload capacity that can be successfully maintained and as to its maximum reserve possibilities. For example, an overfeed stoker will burn West Virginia coal very satisfactorily up to possibly 200% of boiler rating. On the other hand, the multiple-retort underfeed type of stoker will burn this coal equally successfully at 200% of rating, but it is not limited to this capacity, as 300 to 400% of rating can be obtained. In a case of this kind, the load conditions would decide the stoking equipment best suited for the work.

Coals in United States.

The combustion characteristics of coals mined throughout the United States vary considerably. Starting in the eastern portion are the anthracites and such coals as Pocahontas, Clearfield and New River from West Virginia and Maryland, gradually getting into the Pittsburgh and Ohio coals. In the Middle West are Illinois, Missouri and Kansas coals which, with their free-burning characteristics, are entirely different from the eastern coals. Going farther west are the Denver lignites with their high percentage of moisture, which again are different from the lignites of Texas and North Dakota.

Various poor grades of these coals must be contended with by central stations and industrial plants, and the object of this paper is to outline briefly the action of these coals on different types of stoker equipment. Only the type of stoker equipment best suited for load and coal conditions is discussed; the draft and setting conditions, on the other hand, might be the deciding factor in a particular installation.

Anthracite Coals.

The larger sizes of anthracite coal are taken for domestic use, and only the smaller sizes are available for firing steam boilers. On account of the small size, this coal is very difficult to burn, and in general nothing has as yet been devised to handle this fuel successfully. On account of the high percentage of fixed carbon in the coal, it is difficult to ignite, and expert firing must be used to obtain any results at all. In burning this coal, a slight pressure is used under the fire. A few years ago, evaporative tests were conducted on the overfeed type of stoker with the smaller sizes of Nos. 1, 2 and 3 buckwheat coal and fairly good results were obtained as given in Table I. Another test on the overfeed type of stoker gave an equivalent evaporation of 8.4 lb. of water from and at 212° F. per pound of dry coal when using a mixture of run of mine bituminous coal and anthracite buckwheat, No. 2, in the proportions of one-quarter bituminous to three-quarters anthracite. This result was obtained when the boiler was operating at approximately normal rating.

Table I.—Performance of Overfeed Stoker.

Applied to 250 and 500 Hp. Boilers When Burning Buckwheat Anthracite Coal.

Performance Characteristics.	250 Hp.	500 Hp.
Percentage of boiler rating during test	77.6	87.4
Duration of test, hours	9.5	10
Temperature of flue gases ° F.	713	581
Pounds of dry coal per sq. ft. of grate surface per hour	14.5	13.7
Equivalent evaporation from and at 212° F. per lb. dry coal	7.21	8.63
Equivalent evaporation from and at 212° F. per lb. combustible	8.54	10.67

Coal Used—P. & R. Anthracite—Rice.
95.7% passing through a 3/ 8-in. round mesh.
41.6% passing through a 3/16-in. round mesh.
4.7% passing through a 1/16-in. round mesh.

Although the handling of this coal on an overfeed type stoker gives fairly good results it is not so successful that it could be used generally. That is, each successful installation seems to be surrounded by good local conditions and a good understanding of the requirements of burning this coal. There are many plants in service giving good results. This coal has been burned on many types of chain-grate stokers but has not, in any way, been successful except on that type using grate bars particularly designed for fine anthracite coal and permitting the use of air pressure under the fuel bed. There have been many recent installations of this type of chain grate for handling small sizes of anthracite coal, and although definite information is not available at this time, this method promises to excel others for this particular coal.

Attempts made to burn the fine anthracite coals on

the underfeed type of stoker have generally been unsatisfactory. On account of the high fixed carbon content of anthracite coal, there is no question but that it can be handled best on a flat grate or an overfeed type of grate or stoker. While attempts to burn this coal on an underfeed type of stoker have proven unsuccessful, a mixture of Eastern bituminous and anthracite screenings has been burned satisfactorily.

TABLE II.—EFFECT OF VARIOUS PERCENTAGES OF ANTHRACITE COAL.

Anthracite coal, % of mixture.	Cost of mixture per ton. Dollars.	Cost of coal per 1000 lb. of water from and at 212° F. Dollars.	%
0	3.00	0.132	100
25	2.625	0.126	96
33.3	2.50	0.123	93
40	2.40	0.120	91
50	2.25	0.120	91

The objection, however, to this is that an elaborate mixing scheme must be used to obtain a proper and thorough mixture of the two fuels.

Recent tests conducted on the inclined underfeed stoker show that about 600 lb. of a mixture of 50% anthracite and 50% bituminous coal can be burned per retort per hour. Of course, the object in burning a mixture of bituminous and anthracite coal is to reduce to a minimum the cost of making steam. The relative cost of the anthracite and bituminous coal is, therefore, the main factor. As the percentage of anthracite coal is increased, the total amount of coal necessarily burned also increases, due to the lower heating value per pound of the mixture, and also the lower efficiency. Test results show that from a 0% mixture of anthracite with bituminous coal to a mixture of 50% anthracite and 50% bituminous, the efficiency dropped 7%. The amount of refuse handled also increases when burning this mixture, and the fixed charges increase due to a reduction in capacity. There is also, as stated above, an additional cost of mixing the two coals. As all of these factors vary for different plants and localities, the percentage of anthracite coal that will permit minimum unit costs differ so that each individual case must be considered when the individual conditions are known.

To illustrate. In Table II is shown the cost of evaporating 1000 lb. of water from and at 212° F. on the basis that bituminous coal costs $3 per ton and anthracite coal, $1.50 per ton.

EASTERN BITUMINOUS COALS.

The coals used in most of the large representative central stations and industrial plants in the East are mainly the semi-bituminous and bituminous coals coming from West Virginia, Pennsylvania, Maryland, etc. This coal can be burned very successfully on the overfeed and the inclined underfeed type of stoker; also on some types of single-retort underfeed stokers. On account of the characteristic caking of this coal when burned, the chain-grate stoker is not suitable. The selection of either an overfeed or an underfeed type of stoker is then reduced to a question of load conditions.

For the large central-station plants where extreme flexibility is required in the equipment in order to take care of peak loads and sudden demands for steam, there is no question but that the multiple retort inclined underfeed stoker should be used. In industrial plants, where not more than 200% maximum reserve capacity is required in a stoker equipment, the overfeed type of stoker will, in the final analysis, give the best results. For example, with the inclined underfeed type of stoker, a range of operation can be obtained from 50% of boiler rating to 400% of boiler rating with very little difference in efficiency, as shown in Table III. For the overfeed type of stoker, the range of operation is within the limits of 75 to 200% of boiler rating.

A few years ago, the most successful type of stoker for handling Pittsburgh coals was the overfeed type, and even today it is questionable whether, within the limits of the operation of this type of stoker, more satisfactory equipment can be obtained. The inclined underfeed type of stoker, having come into use in the last few years, has shown its ability to handle Pittsburgh coal very easily and, in addition, is giving more satisfactory results than are obtained with the overfeed type of stoker when higher ratings must be obtained from the boilers. Therefore, in the selection of a suitable stoker equipment for burning this coal, the load condition would decide the question as to whether or not the inclined underfeed type would be used or the overfeed type of stoker.

TABLE III.—PERFORMANCE OF UNDERFEED STOKER.

A 400-hp. Boiler Burning Eastern Bituminous Coals.

Per cent of boiler rating during test	50.7	103	145	202	1361
Duration of test, hours	25	24	13.25	24	2
Temperature of flue gases, ° F.	429	465	505	605	743
Lb. dry coal per sq. ft. of grate surface per hour	9.793	16.4	23.7	33.5	75.2
Carbon dioxide, %	12.7	14.3	12.7	13.6	15.4
Per cent efficiency of boiler, furnace and grate, based on dry coal	79.7	78.02	76.6	75.5	59.8

Approximate Coal Analysis.

Per cent moisture	4.0
Per cent volatile matter	24.1
Per cent fixed carbon	68.6
Per cent ash	7.28
B.t.u. dry	14963

There are many plants in the Pittsburgh district where chain-grate stokers are used. While it cannot be said that this stoker is wholly unsatisfactory for these fuels, on account of their coking qualities and the characteristic caking effect, the principle of the chain-grate stoker is fundamentally wrong for such coals. The manner in which they act on a chain-grate stoker was quite apparent in a test recently conducted on a chain-grate stoker having a front choking plate. As the coal ignited, it was pushed off this coking plate by means of plungers and it passed onto the chain part of the stoker in large lumps, resembling blocks. On this particular stoker, forced draft was used. By viewing the furnace fire, it could be seen that the air was going up between these blocks of coke and not through them. In other words, it seemed that, if one could get into the furnace and paddle down the fuel bed, covering up these holes, proper results could be obtained. In general, this is the action of this coal on any type of chain-grate stoker.

TABLE IV.—PERFORMANCE OF OVERFEED STOKER.

A 335-hp. Boiler Burning Pittsburgh Coals.

Per cent of boiler rating during test	105	210
Duration of test, hours	10	8
Temperature of flue gases, ° F.	503	718
Lb. dry coal per sq. ft. of grate surface per hour	17	38
Calorific value of dry coal per lb.	13,428	13,202
Per cent efficiency boiler, furnace and grate based on dry coal	75.5	68.8

COKE BREEZE.

In the Pittsburgh district there is considerable coke breeze that is now without a market due to the fact

that there is nothing that can satisfactorily burn it. Many attempts have been made to burn this on the overfeed type of stoker, and all of these have resulted in miserable failures. The best way to burn coke breeze at the present time is on a flat grate with a medium pressure under the grate. A special design chain-grate type of stoker is being installed in many plants and promises to give a really successful way to handle this fuel mechanically. Forced draft is used with this stoker. Attempts are now being made to burn this breeze on the underfeed type of stoker but no commercial success has yet been attained.

Middle-West Coals.

In the Middle West, where Illinois grades of coal dominate, in general, the chain-grate type of stoker is most suitable for limited boiler outputs—up to about 200% of boiler rating. It is surprising, however, to find that in Indiana, where the coal veins are adjacent to those of Illinois, the overfeed type of stoker is more generally used. This is because some of the coals in Indiana have more of a coking or caking nature than a free burning characteristic.

Table V.—Performance of Chain-Grate Stoker.

A 514-hp. Boiler Burning Low-Grade Illinois Coal.

Per cent of boiler rating during test	117	150	169	189
Duration of test, hours	8	6.5	8	8
Lb. coal as fired per sq. ft. of grate surface per hour	32.9	43.2	44.9	47.3
Carbon dioxide, %	6.3	8.1	9.5	10.3
Per cent efficiency boiler furnace and grate based on dry coal	88.6	65.3	65.1	60.8
B.t.u. per lb. of coal as fired	10,550	9205	10,010	11,350

The inclined underfeed type of stoker is now being installed for handling Middle-West coal, and the one thing that will make it permanent is the flexibility of the equipment and the possibilities of higher boiler ratings.

Table VI.—Performance of Underfeed Stoker.

A 558-hp. Boiler Burning Illinois Carterville Coal.

Per cent of boiler rating during test	163	182	212	328
Duration of test, hours	12	12	12	2
Temperature of flue gases, ° F.	512	489	562	633
Lb. dry coal per sq. ft. of grate surface per hour	227.7	34.9	37.2	62.3
Carbon dioxide, %	13.6	13.4	13.0	15.1
Per cent efficiency boiler, furnace and grate, based on dry coal	77.7	76.1	76.4	....
Calorific value of coal as fired, B.t.u. per lb.	11,877	10,226	11,232	11,378

Average Approximate Coal Analysis.

Per cent moisture	10.3
Per cent volatile matter	28.9
Per cent fixed carbon	41.8
Per cent ash	18.9
B.t.u. as fired	10,226
B.t.u. dry	11,401

Lignite Coals.

Years ago, the overfeed type of stoker was installed in the West to burn Denver lignites and was not generally satisfactory. There are many chain grates burning this coal and, in a general way, it might be said that they are fairly satisfactory. There is nothing, however, that has successfully handled this fuel in a commercial way and considerable development work is now being done in an endeavor to apply or change the inclined underfeed type of stoker to handle this coal. This type of stoker has one characteristic which is particularly adapted for lignite and that is that a very heavy fuel can be carried and the air supply adjusted, which eliminates the difficulty of blowing holes through the fire and distributing dust and ash onto the heating surfaces of the boiler to lower efficiency, choke the flues, interfere with the draft, and to be objectionable generally.

North Dakota lignite coals have been tested in a general way on the inclined underfeed type of stoker mainly to ascertain the method of firing, and the characteristic action of this coal on this type of stoker. It was found that the coal was extremely easy to handle and any clinkers that formed could be easily removed at the rear of the stoker. During this test, the results of which are given in Table VII, it was thought that considerable higher ratings could be obtained if the equipment had been originally designed for feeding this grade of fuel. In all of the tests, very little clinker trouble was encountered, and it was not necessary to dump the fire during the duration of the test, which was of 7 hours.

There are lignites in Texas that still require some satisfactory means of burning. About every type of stoker has been tried out on this coal but no one seems to have especial advantages that would demand its general use. Attempts are now being made to handle this on the underfeed type of stoker, but it yet remains to be determined whether or not this type will be satisfactory.

Table VII.—Performance of Underfeed Stoker.

A 600-hp. Boiler Burning North Dakota Lignite Coal.

Per cent of boiler rating during test	123	139
Duration of test, hours	6	7
Temperature of flue gases, ° F.	467	467
Lb. dry coal per sq. ft. of grate surface per hour.	32.4	31.4
Carbon dioxide, %	13.2	12.6
Per cent efficiency boiler, furnace and grate, based on dry coal	56.2	64.6
Approximate Analysis of Coal.		
Per cent fixed carbon	30.0	30.3
Per cent volatile matter	20.7	28.3
Per cent moisture	34.4	33.5
Per cent ash	5.9	7.9
B.t.u. as fired	7029	7120

OLD-STYLE VOLTMETER NEEDED BY NATIONAL MUSEUM.

Specimen of Early Lamp Indicator Sought to Complete Collection.

The United States National Museum at Washington has a valuable collection of early electric lighting apparatus which is being added to as gifts can be secured. One of the specimens needed to complete this collection is the early lamp indicator or engine room voltmeter, as it was sometimes called. This type was built by the New York Edison works, also known as Bergman & Co., 17th and Avenue B, and appeared about 1883 or 1884.

This was a large sized instrument of wooden box construction, built to stand upon a shelf with leveling screws and pointer swinging horizontally. This instrument in principle was a Wheatstone bridge, having two carbon lamps and two metallic resistances, comprising the four arms of the bridge. It was a very sensitive instrument and had the bad fault of varying with the variation in the lamps, as these were very far from being stable in continued use.

If any of our readers know of the existence of one of these old type instruments, it would be well placed in the National Museum, where it would be preserved and form part of a comprehensive collection, they are requested to communicate with the United States National Museum, Washington, D. C.

Contractor-Dealer Should No Longer Neglect Farm Lighting Business

Has Been "Asleep at the Switch" as the Farm-Lighting-Plant Train Went By—Much Profitable Business Lost—Time to Wake Up to Opportunities

By GEORGE W. HILL

Not unlike many other industries in America growing out of an almost immediate demand, brought about by changing conditions, the farm electric lighting and power business has sprung up almost over night. The American farmer slept and dreamed of his home modernized with steam heat, modern sanitary conveniences, electric light and power, all of which his city brothers were enjoying. No sooner did he awake that he found a realization of his dreams and there was born into the industrial world an infant which bids fair to become one of no less importance than the automobile and the tractor industry.

For years the demands made upon the inventive mind of the ingenious Yankee to supply machinery to supplant labor in the great factories of the country were so great that no thought was given to the tiller of the soil, but as conditions changed and as we came to realize more and more the importance of the farmer as a strong link in the economic chain which sustains our government in peace and in war, the necessity of offering substantial encouragement became more apparent to everybody until today, the eyes of the whole world are turned toward the American farmer, from whom we find the greatest support for our great army of soldiers and industrial workers, and whose capital we find seeking investment in essential industries with a dual purpose, that of patriotism and profits.

Not so many years ago the farmer, the grain and the live-stock dealer were practically the only ones who knew anything about the farm-products market, but today everybody is interested. Nearly everybody knows what wheat, corn, oats and hogs are worth on the world's markets. It would seem almost unpatriotic not to be interested in the welfare of our American farmers. Our Federal Government is offering every possible encouragement under the circumstances to the tiller of the soil. Appeals to our farmers are being made by the whole world to plant more and raise more food for the hungry months in every war-torn country of Europe in addition to satisfying our own needs.

The farmer is confronted with a problem no less perplexing than that confronting almost every industry in the world—that of acute labor shortage—and yet from a patriotic standpoint he is producing more with less labor. This has been made possible by increased facilities which have grown out of the necessity. Improved methods have been introduced and many of those who have heretofore retired and turned the farm over to the boys have been compelled again to become active. We also find America alert to provide the farmer with improved labor-saving devices, such as electric light and power plants, tractors, auto trucks, and many other pieces of machinery which in the hands of the intelligent operator do the work of many men and horses.

Farm Lighting Plants Not Experimental.

The electric light and power plants which have been and are now offered are a remarkable example of the possibilities and imaginative power of the great Yankee mind. The bringing together of old, well tried and proven mechanical and electrical principles into new form has brought about great results. Unlike many such new developments, the user has not been compelled to bear the burden of the experimental stages through which such things usually pass. As there have been no new or untried principles employed in the development of the electric light and power plants, consequently nothing new or experimental is to be found in them.

City central-station and power-distributing companies have tried extending their lines into the farming districts, but as a rule it has not paid them because of the heavy cost of line construction. The only electrical current practical to use on the farm is from a low-voltage direct-current plant on the premises. Those of us who have been connected with the electrical industry for the past thirty odd years, well remember the old direct-current generators which perhaps lighted our home town. The other principal electrical feature of the plant is the electric storage battery, the practicability of which has been recognized for more than a quarter of a century. The only essential difference therefore between the plants which have been offered to the farmer and those formerly used for town lighting is the internal-combustion engine which is being used to drive the generator, and the automobile industry has long since solved the problem of the engine.

Nearly all of the farm lighting plants on the market today employ engines which resemble so closely the one which the farmer has been using on his farm or on his car for the past ten or fifteen years, that little attention is paid to this feature of the plant except to know whether it is a two or four-cycle, air or water-cooled engine.

The farmer only has to be sold on the utility of the plant, what it will do for him, how long it will do it, and how economically as compared with other forms of light and power.

Adaptability and Advantages of Farm Lighting Plants.

The following is a list of the principal things which a good electric light and power plant will do for the country home.

It Betters Living Conditions.—It furnishes better and safer light, eliminates smoky, dirty coal-oil lamps, makes automatic water system possible, minimizes fire hazards, makes the home more cheerful and comfortable, saves much labor around the house, keeps the

children at home, and attracts desirable company for the family.

It Pays for Itself.—It makes the following savings possible, thus quickly paying for itself:

Runs washing machine 4 hours each week	$ 1.00
Runs cream separator 14 times each week	1.05
Pumps water for a complete supply	1.00
Runs vacuum cleaner 7 times each week	1.00
Saves two hours each week in ironing	.60
Runs electric fan during hot weather	.25
Permits small boy to milk 50 cows 14 times each week, saving 3 grown persons' time 2 hours daily or 42 hours total weekly	12.60
Total (neglecting numerous other chores)	$17.50

Saving $17.50 each week for 52 weeks results in saving in labor cost of $910 in one year.

It should not be a difficult matter to sell a farmer something which betters living conditions and also pays for itself in a year or two.

It Modernizes the Country Home.—It provides constant water pressure for the lavatory, the bath, the toilet, and sink, sprinkles the lawn, and furnishes ample fire protection. It replaces antiquated, troublesome and inadequate lighting by modern, convenient and satisfactory lighting. It provides modern conveniences and helps make the country home practically as desirable in this respect as the city residence.

It Provides Convenience and Comfort to Those Who May Be Sick.—It heats water quickly, heats electric hot pad, operates electric fans, provides light at all times of the day or night by merely pushing a button. It does not burn the health-giving oxygen in the room. It provides current for call bells. It assists the doctor in his calls, assists the nurse in her duties and makes the sick room more bright and cheerful.

It Saves the Time and Labor of the Housewife.—It runs the washing machine and wringer, saves much work and many steps on ironing day. It saves the bother and time of taking care of oil lamps. It provides hot and cold water at the sink, sweeps the carpets and rugs with a vacuum cleaner, cleans furniture, mattresses and tapestry without removing. It runs the cream separator for her, pumps the water without effort or time loss, furnishes heat for toasters and coffee percolator, assists the mother in the care of her children at night.

It Saves Time and Labor for the Farmer.—It runs the milking and other dairy machines, farm mill, sheep and horse clippers, grindstone, saw, etc., and provides a bright light throughout yards and out-buildings. It saves much time and lessens the danger in getting about the place at night.

It Makes for More Productive Labor Hours in the Field.—A boy can milk cows, grind feed, pump water and do many other things electrically which would require the time and labor of older persons.

It Keeps the Children at Home.—Boys and girls enjoy their home better because it is modernized. They invite and everyone enjoys having company. It causes both old and young people to have a pride in their home. Relief from many of the chores and much of the drudgery gives more leisure to enjoy the home. It provides the best light for students. Less hard work makes mother more cheerful. All told, it makes the home a more desirable place to live in.

It Helps to Solve the Labor Problem.—It makes the farm more attractive to those seeking employment. It eliminates "Blue Monday." Ask mother why. It reduces the amount of work to be done and makes it possible to dispense with all or most of the outside help about the house.

It Is an Improvement to the Farm.—It increases the value per acre like other improvements. It is a valuable, profitable and permanent investment. Electric lighted farms sell more readily.

Opportunities for the Electrical Contractor-Dealer.

Think this over, Mr. Electrical Contractor, and tell us why you cannot sell such plants to the farmers of your community where you can make him admit all of the above points. Any farmer will tell you that he will buy anything at almost any price which will better living conditions and pay for itself several times over during its useful life.

There are hundreds of thousands of prospects in America, who will sooner or later possess an electric lighting plant of some kind, yet the electrical industry has been asleep at the switch and is letting these great possibilities slip through its fingers.

The result is that the business is fast getting into the hands of the implement dealer, hardware and automobile dealers, and numerous other merchants are looking with eager eyes toward the electric farm lighting business as a means of increasing their annual profits materially.

This business logically belongs to the electrical dealer and contractor. He is the logical person to handle this industry in his respective community, because he is very likely the only person equipped to do the wiring, and furnish the fixtures and utility devices. The profit on the sale of a plant, plus the profit on the things which usually go with the plant, is very attractive or at least should be to an electrical contractor and dealer.

Many of our present-day contractors would be much better off if they were to spend the same time in the country selling a farmer a plant and installation, with practically no competition than he would be playing the role of a Sherlock Holmes in an attempt to learn how much his competitor is going to bid on some house-wiring job where possibly the gross amount of the job would not equal the profit to be had in selling one country electric lighting plant.

The writer could never understand why the electrical contractors could stand idly by and let an opportunity as important as the electric farm lighting business slip through their fingers, while whittling pine sticks on the sunny side of their shops and howling about how rotten conditions are in the particular town in which they live.

Wake up, Mr. Electrical Contractor! Get into the game! Forget the competitor you are trying to put out of business, and put yourself into a good profitable business. You know how to sell goods. You know how to wire houses and barns, and you should be out and after this important, profitable and highly promising business.

Profits in the Business.

You can sell a farmer a lighting plant, do the wiring, hang the fixtures and complete the job, and make $200 clear on one reasonably sized job in less than a week. How many house-wiring jobs do you do in town to make $200? How often do you find, after doing a good many jobs, that in an effort to beat your competitor you have lost $200 or more? If you are in the electric business then the electric farm lighting belongs to you.

You may say that the plant manufacturers are not

coming to you to induce you to accept the distribution of their plants. This is true at this time, but if you show signs of life you will find that they would prefer you to nonelectrical dealers, because this solves the installation problem—the most perplexing they have to contend with at the present time. Now is the opportunity to take back that which slipped away from you when you were "asleep at the switch." The manufacturers are fast learning that the things most needed at this time to complete the cycle from manufacturer to user are intelligent selling and installing. There seems to be a tendency just at this time among these plant manufacturers to change their selling policy materially and this opens a great opportunity for the contractor-dealer to reclaim a branch of the electrical business which came very near being lost to the industry.

How to Do Business with the Farmer.

Secure the agency of some good plant and go to work. The farmer may be a stranger to you at first, but you will soon know him. And he will best know you by your conduct and especially if you deal honorably with him, for he will boost your game if he likes you. He is one of two things, either the best booster or the most persistent knocker in the world.

Sell the plants and make the user help you sell his neighbors. Sell him permanently. Sell him so that he will look to you for all of his electrical requirements. He will go out of his way to tell the world that you are a good fellow and that you treated him all right. He is the nicest fellow in the world to do business with, if you act perfectly natural when you are in his presence. Speak the farmer's language and don't give him the impression that you are the least bit wiser than he is. Just tell him about the merits of your plant, and don't knock the other fellow's plant. Just show him what the plant will do for him and you will find him an interesting listener and a reasonable person to do business with.

Many contractors object to buying plants from the manufacturer with sight-draft bill of lading attached, yet some smooth-tongued orator comes along and sells him a bill of wire, knobs, tubes, fixture parts, etc., which he dribbles out a little at a time and, sad to relate, too often without profit and more often on book accounts which are never collected.

The farmer is accustomed to buying high-priced articles like tractors, automobiles, etc., and the writer has often sold a farmer an electric plant and installation amounting to from $800 to $1000 in less time and with less effort than is sometimes required to sell some city customer a $47.50 vacuum cleaner or a bill of fixtures amounting to less than $100.

Merchandising to the farmer consists of having a meritorious article and the ability to tell him in a plain elementary way what it will do for him. It was first thought that the farmer would buy only cheap electric fixtures and the larger plant concerns arranged catalogs and displays based upon this idea, but they have found that the farmer demanded something better, and today the farmers are buying the highest class fixtures on the market.

The writer recently sold a farm electric light plant for $650 and he also sold the wiring, fixtures, a vacuum cleaner, iron and an electric washing machine, and when the job was finished the farmer handed him a check for $1045 and he did cheerfully, for there was not a better set of fixtures in ten homes in an adjacent town of 25,000 people. This job was completed in exactly five days. Four such jobs per month would net the dealer approximately $1000 or $12,000 per year. This is possibly as much profit as would be had on three or four times the gross business done in town where unintelligent competition must be met.

The selling of an electric lighting plant to a farmer, if sold properly, places him in the market for an amount of wiring, fixtures, and accessories equal to, if not exceeding, the price of the plant. He may not buy them all at once but from time to time you will be called upon to furnish one or more utility devices. The good, conscientious dealer who sells 25 plants in his neighborhood has made a nice profit on the sale and has created a demand for some ten to twelve thousand dollars worth of lamps and other accessories within the next 12 to 18 months.

If you are not financially able to buy plants with sight-draft bill of lading attached, just ask your banker to explain the workings of the trade acceptance. Your banker will usually co-operate with you on the trade-acceptance basis, as this is the most desirable class of paper they can find to handle. The banker likes short-time interest-bearing paper and if you will show your banker the possibilities there are in the farm electric lighting business he will become interested in helping you without a doubt.

BOOK REVIEW.

"Theory and Operation of Direct-Current Machinery." Prepared in the Extension Division of the University of Wisconsin. By Cyril M. Jansky. First Edition. New York: McGraw-Hill Book Co., Inc. Cloth, 285 pages (6x9 in.), with numerous illustrations. Supplied by Book Department, International Trade Press, for $2.50.

A practical book dealing with the construction and operation of direct-current machines and their auxiliary appliances. The treatise is essentially elementary and non-mathematical, and should prove of value to all concerned with the operation and care of direct-current machinery.

The book is divided into 16 chapters dealing with the fundamental magnetic principles, electromagnetism, electromagnetic induction, units of measurement, transformation of energy, continuous-current generator and motor, the magnetic circuit of the direct-current dynamo, armatures, uses of electrical energy, types of dynamos, commutation, operating characteristics of generators, operation and care of generators, operating characteristics of motors, operation of three-wire systems, selection and installation of dynamos.

The book is well and simply written. The text is supplemented by numerous examples, working out which will test the reader's grasp of the preceding text. The many half-tones and line diagrams are well produced, and the general arrangement of the book is commendable, although some of the half-tones seem needless. The diagrams of armature windings are very clear, the two-color diagrams being a good feature. However, there are a few statements and mistakes that rather suggest hurry in sending the book to press, errors that should be remedied in future editions. For example, on page 43 the number of dynes in the pound is given as 444,800; on page 62 the value is given as 445,000. The correct value is 444,823. On page 189 appears a wiring diagram of a Tirrill regulator, which contains an error in that the coils of one of the electromagnets is reversed, making the magnet inoperative. The book should prove very useful for those desiring to obtain an elementary understanding of the fundamentals of direct current and the basis of direct-current machinery working.

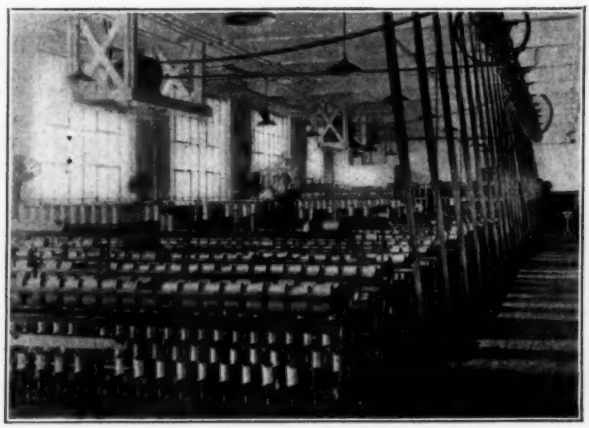
Electric Drive Applied to Silk Industry

Advantages of Central-station Service for This Work—Selection of Motors and Drives—Interesting Data on Present Installations

By CHARLES T. GUILFORD

The silk industry in America may be said to have started about 1826, at which time silk culture was attempted with some degree of success. This period was brief, lasting only about 10 years, but long enough to bring into existence silk throwing, spinning and weaving, which has grown steadily ever since. In 1849 the value of the silk products in the United States was $1,809,000 and represented 67 factories. This grew in 1859 to 130 factories and again fell off in 1869 to 86 factories. From this time on, the growth was uniform and rapid until in 1914 the value of the silk products reached the figure of $254,000,000, representing 904 factories with an aggregate of 117,000 hp. Assuming that the rate of growth has continued during the past four years in the same ratio, as from 1909 to 1914, the value of the products would be today $288,000,000 with an aggregate of 128,000 hp.

Excellent Arrangement of Lighting Units for Illuminating the Frames.



A Group Electric Motor Drive Applied to First-Time Single Deck and 2-C Spinners.

At the present time the silk manufacturing industry includes the manufacture of finished silk products such as woven fabrics, braids, trimmings, sewing, embroidery and floss silks, machine twist, thrown silk and spun silk.

The power used in silk mills in the early days was the same as that used by most pioneer textile industries, viz., water power. On this account, mill sites were selected on or near streams capable of developing the necessary power. With the development of the industry, along with other industrial enterprises, available water sites were taken up and new enterprises or extensions of the old ones were obliged to resort to power produced by the steam engine. This power has, until recent years, been supplied by a power plant built as part of the mill and operated by the mill owners. Both the waterwheel and steam engine transmit their power through shafting, pulleys and belts to the machines to be driven, but water power, although more uniform in speed than steam power, has been superseded largely by the steam engine, because of the lack of a uniform and sufficient supply of water for increased business.

The steam engine has been the principal source of power in silk mills for many years, but is, in turn, giving way to the steam turbine or to power bought from a central power station. In either case, the motive power used at the mill is electric with the motor to transmit it to the machinery. The speed thus obtained is uniform instead of pulsating as with the steam engine and can be maintained at a fixed maximum.

Advantages of Central-Station Power.

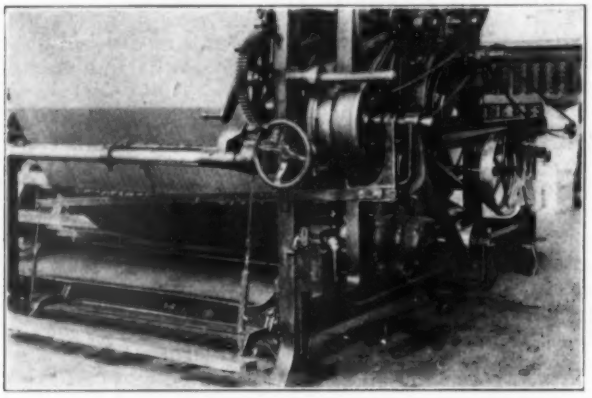
On account of modern development and efficiency, the central station is able to supply power to mills at a quality and rate superior to that developed at the ordinary mill power plant and is, therefore, destined to become the sole source of power for these plants. The business of the central station is to produce power and give first-class continuous service. They, therefore, are specialists in this line and since they produce power in large quantities with up-to-date and efficient machinery, they are able to give better service at lower rates than can be obtained at the individual mill power plant.

Some of the advantages of central-station service which make it especially desirable for use in silk mills are as follows:

1. *Low Cost of Power.*—Most central stations have equipped their plants with apparatus especially adapted to take on mill loads and have, therefore, adopted as part of their business campaign among mills a schedule of power rates which are lower than the cost of power produced at the ordinary mill power house with steam engines. In addition, the use of central-station service permits the more efficient use of power, which of course is cheaper.

2. *Uninterrupted Service.*—One of the most important requisites for a mill is that the power service should be continuous and available at all hours. The modern central station has provided auxiliary machinery, switchboard protective devices, lightning pro-

tection for transmission lines and transformers, so that cases of interruption of service are rare. In addition, the service is available night and day, noon hour and Sundays, which is frequently necessary and always desirable at a silk mill.



Individual Westinghouse Motor Gear-Drive Applied to a Silk-Warper.

3. *Overload Capacity.*—The matter of temporary or permanent overload in a mill, often causing loss of speed and hence loss of production, is amply provided for by the reserve power of the large units at the central station. Overload is automatically taken care of by the station and the mill has the privilege of adding to or cutting down its load at will.

4. *Location of Mill.*—As the central station can bring its electric line to any location within its district, the manufacturer may locate solely with reference to convenience for the manufacture of his product, and the necessity of choosing a site convenient for water power or for getting the fuel supply, condensing water, etc., are factors which may be eliminated.

5. *Decreased Insurance.*—As the substation for power supply to a mill is located outside of the mill in a specially constructed house and as electric lines, motors and switches are all thoroughly protected with devices approved by both fire and liability insurance companies, and as steam engines and boilers are eliminated as risks, insurance, including fire, liability, steam engine and boiler, is materially reduced.

6. *Cleanliness.*—As the central-station service consists of transformers, wires and motors, all of which are non-dirt and non-smoke producers, the mill is rid of the dust from coal handling, smoke from the boiler house, and dirt, dust and oil from large transmission shafting, pulleys and belts.

7. *Power Supervision Simplified.*—The general supervision of the mill power plant, buying of fuel and supplies, making repairs and the necessary clerical work and bookkeeping are done away with.

8. *Lower Installation and Maintenance Cost.*—In common with practically every other industry, central-station service is desirable for silk mills on account of its lower installation and depreciation cost and the small expense of properly maintaining the equipment.

Selection of Motors.

The application of central-station power through the electric motor is the most modern and efficient method for driving silk machinery and it possesses certain distinct advantages over any form of drive yet devised. The motor which is best adapted for this work is the alternating-current, constant-speed motor. Among the advantages of motor-drive, especially alternating-current motors, are:

1. *Uniform Speed.*—This motor will maintain a uniform maximum speed and will transmit this to the machines without change during the entire time of operation. This speed is not dependent upon the operator, but is automatically controlled by the uniform speed of the generators at the central station. The result to the silk manufacturer is, therefore, an increased production and a better quality of goods than can be obtained with the steam-engine or gas-engine drive.

2. *Cleanliness.*—In the case of individual drive, all shafting is eliminated, with the result that dirt or oil throwing is absent.

3. *Facility of Increase.*—If additional machinery is to be installed in a mill or if it is desirable to rearrange present machinery, both may be done with motor drive without reference to the power plant or mill shafting drive. Power supplied from the central station makes it possible to install motors of the exact size for the additional machinery and to place them and the machines in any desired location.

Methods of Motor Drive.

There are three general methods of driving silk machinery by electric motors. The first method is to use one motor to drive the entire mill, if a small one, or of several motors, each to drive a section of the mill. The second method is by motors, each arranged to drive a group of machines of similar type or the so-called group drive, and the third by a motor to drive each individual machine or the so-called individual drive.

The first method possesses one distinct advantage over the steam engine, viz., it gives to the whole system of drive a uniform constant speed which results in more and better production. This method, however, is seldom used as it still requires considerable transmission shafting, belt and pulleys throughout the mill.

The second method, or group drive, possesses the advantages of low first cost and the elimination of the main transmission lines, hangers and belts. With this method the mill is usually divided into sections comprising part or all of the machinery required for one process. It is specially adaptable for machines which require a small amount of power. In this case, a motor is conveniently placed so as to reduce the shafting and belts required to a minimum. This has the advantage also of permitting part or all of a process to be run as required and of preventing a shut-down of more than a small part of the mill due to accident. This form of drive has been adopted in a number of throwing plants, ribbon and broad silk mills.

An example of a ribbon silk mill using group drive is here given. Before adopting electric drive for this mill, tests were made to determine the costs of power under the existing conditions and under the proposed conditions of electric drive with the following results:

Estimated yearly cost of heat, light and power under existing conditions	$7239.70
Estimated yearly cost of same with proposed electric drive	5993.60
Yearly saving	$1246.10
Estimated cost of motors, control and wiring complete	$3926.00
Estimated return on the investment	31.5%
Actual cost of motors, control and wiring complete	$3926.00
Salvage value of old apparatus	1500.00
Net cost of installation	$2426.00
Actual yearly saving (checked by meter readings was slightly less than estimate of $1246.10)	$1246.10
Actual return on the investment	51%

In addition to the above, speed tests were made

both before and after the installation of motors to determine the relative production. The records taken over a long period of time showed an average net result in increased production, due to the electric drive, of 7%.

This test was made in a ribbon silk mill containing the following load:

Motors. No.	Hp.	Speed, R.p.m.	Class.	No. of Machines.
1	10	860	Finishing Room.	4 Sewing machines. 1 Blocking machine. 6 Sizing rolls.
4	5	860	Warping.	34 Warpers.
1	2	1140	Winding.	27 Winders, 670 Spindles.
8	5	1140	Weaving.	196 16-ft. looms.
1	3	1140	Doubling.	24 Doublers. 10 Spindles each.
2	¾	1140	Winding.	2 26-Spindle winders.

The load, consumption and maximum demand of a throwing mill having group drive is here given:

Motors. No.	Hp.	Speed, R.p.m.	No. of Machines.	No. of Spindles.
2	50	1170	28 Double deck spinners	472
2	35	1170	26 Double spinners	362
1	35	1170	14 Atwood 2-C spinners	182
1	15	1170	12 Single deck spinners	94
1	5	1735	15 Columbian winders	140
			8 Doublers	70
1	35	1170	10 Double deck spinners	196
1	5	1735	Machine shop in basement.	
1	25	1170	20 5-B spinners	104

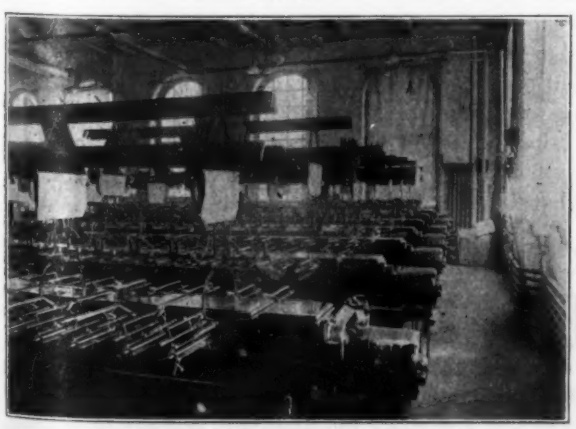
POWER CONSUMPTION.

Month.	Kw-h.	15 Min. Maximum Demand.
January	74,000	192
February	68,800	192
March	77,700	210
April	66,800	216
May	70,200	210
June	66,100	198
July	59,000	204

An example of a broad silk mill showing group drive is given below and illustrates the method of grouping the machines:

No.	Hp.	Speed, R.p.m.		Driving.
1	7½	1170	16	Winders, 34 spindles each.
			12	Warpers.
			3	Finishers.
1	15	1155	14	52-in. Looms.
			11	52-in. Looms.
			35	36-in. Looms.
			34	36-in. Looms.
1	15	1155	5	52-in. Looms.
			18	52-in. Looms.
			36	36-in. Looms.
			36	36-in. Looms.
			2	30-Spindle auillers.
1	5	1140	6	32-Spindle winders.
			9	Large warpers.
			1	Finisher and fan.
1	20	1160	60	30-in. Looms.
			63	36-in. Looms.
			11	36-in. Looms.
			50	36-in. Looms.
			1	Blower.
1	4	1040		Freight elevator.

The third method, or individual drive, is the most satisfactory and is being adopted for most of the new mill installations, and also in a large number of cases in changing over present machinery. The definite advantages due to this drive are as follows: Increased production, cleanliness, absence of belts and line shafts, and flexibility of location of machines.



Individual Westinghouse Motor Drive Applied to Silk-Winders.

This method has met with marked success in silk weaving, and instances have shown that an increased production of from 5 to 15% has been realized, due to the uniform, maximum speed which is only possible with this form of drive.

This increased production, of course, means increased profits for the mill and may be illustrated by the following example, which is one of a number of test cases. In this particular mill, the estimated value of the output of a loom for a year was $5500, made up as follows: material, 50%; labor, 20%; overhead, 15%; profit, 15%. The increased production in this mill, due to individual loom drive, average 8%. This gave them 8% of $5500 or $440 increased production on each loom per year. The cost of this increase would be 20% for labor and 50% for material as above, or:

.20 × $440 =	$ 88
.50 × 440 =	220
Total	$308

The net gain per loom per year would then be $440 less $308, or $132. This net gain per loom would, in nine months' time, pay for an entire individual motor drive (necessary to run the looms) completely installed and ready to run. After this, the gain would represent a net profit to the company—and in this mill of 1000 looms (800 of which are already changed to electric drive) would represent the handsome net gain each year of $105,600.

The following is a copy from the records of a broad silk mill having a total connected load of 99¾ hp., each motor driving an individual machine.

Month.	Kw. hr.	Max. Demand.
January	6389	28.2
February	5086	35.8
March	4674	42.2
April	9700	44.2
May	7040	49.9

COST OF ENERGY FROM A SCOTTISH WATER POWER.

In advocating the construction of large interconnected power plants and the use of water power where feasible, Cecil H. Roberts, city water works engineer, Aberdeen, Scotland, in an address entitled "The Utilization of Water Power," made the statement that at Kinlochleven, Scotland, operating as it does at high load-factor, energy is generated at the low cost per kilowatt-hour of one-sixteenth of a penny (one-thirty-second of a cent). This cost includes all working expenses plus 5% interest on the investment.

WHOSE PATENTS OR TRADE-MARKS HAVE BEEN INJURED BY THE WAR?

In a recent issue of the *Official Gazette of the United States Patent Office*, Commissioner of Patents J. T. Newton requests any interested parties to supply him as speedily as possible with full details as to any loss of or injury to patents, trade-marks or copyrights which may have been due to the war either in enemy, neutral or allied countries. This request is undoubtedly prompted by the desire that all such damages should be adjusted in the coming peace settlements.

Editorial Comment

Co-ordination of Power Plant Equipment and Load

POWER plants have learned many things since the United States went into the war. Through trials and difficulties as to load, fuel, labor and apparatus have come economies, improvements in the application of men and machines, betterment of plant conditions and a nation-wide desire to save coal.

It has been the rule rather than the exception for the last year for a large number of the country's power plants to burn coals other than those they have previously been accustomed to burning and for which apparatus may be found to have been made primarily according to the combustion characteristics of the coals used. Many difficulties, therefore, followed the change of coal. The combustion characteristics of coal have an important influence upon stoker performance and stoker choice. But flexibiltiy of plant, economy of operaton and conservation of fixed and operating charges are also vital, and these as influencing stoker choice come down to a consideration of load conditions.

Changing from one coal to many coals of inferior grades and nonuniform quality has emphasized the fact that while almost any type of stoker may be made to burn every type of coal, there are certain types or a certain type of stoker that is particularly fitted to a certain coal or a number of coals. In other words, to a certain extent there is considerable leeway in the choice of stoker where the combustion characteristics of the coal are the prime factor. However, when considering a stoker on the basis of load conditions, it is found that stoker choice permits of less leeway than is the case when considering stoker performance with various coals.

Elsewhere in this issue will be found an interesting article by Joseph G. Worker that discusses the combustion characteristics of the various coals, the suitability of the different types of stokers for these coals, and the adaptability of the various stokers to loads, which means their ability to burn small or large quantities of a definite coal according to the sudden transitory or sustained requirements of the load. As is so true in many engineering problems, there may be several ways of solving a problem, of doing something. But there is only one way that is the best. And the choice of stoker equipment is one that should be made only after due consideration, firstly, of load conditions and, secondly, of coal available normally on a cost basis and in emergency.

Out of the war many things have come to the power plant and the boiler room that will remain. Increased loads and shortage of boiler capacity has resulted in a general increase in the rate of working boilers. The large central stations have for many years operated at the so-called higher ratings, and the smaller plants are now doing the same, only to lesser degree. The result is that the choice of stoker for high rates of combustion, the use of a furnace chamber and boiler setting to permit of maintaining these higher ratings efficiently may be expected more and more. The higher rates of evaporation necessitate that greater attention be given the matter of water treatment and the elimination of scale in the interests of conserving boiler tubes and safety. This matter is also vitally allied with the conservation of fuel, of course, since scale and soot are the arch-enemies of coal saving. Another fact worthy of note is that when going to increased rates of evaporation because the solution for increasing steam-making capacity with existing boiler equipment, and when the matter of feed-water purification comes up it naturally follows that the advisability of controlling the feed-water automatically instead of manually also comes in for consideration, thereby helping still further to increase boiler capacity, save coal and place the boiler room on a scientific basis.

Although the urgent war-time necessity for saving coal has ceased to exist, the importance of continuing to save coal in the interests of the nation has not abated. Many are the boiler rooms that have found that to save coal is not the difficult feat once supposed and that it is a profitable undertaking. One thing leads to another, naturally or from force of circumstance. And the boiler room that has just commenced to save coal by better operating methods or better equipment may be trusted to persist in efforts to save coal and cut its costs of making steam.

In normal times coal can be saved only insofar as it pays to save it. Therefore, one of the first things to be done toward saving coal is to obtain economical plant performance, the cost of which includes fuel, labor and fixed charges. Co-ordinating load conditions and plant performance means choosing the coal-burning apparatus best suited to the purpose, operating the various units for the highest economy and therefore with smallest waste, and using apparatus for telling what the plant is doing and how it is doing it.

Coal Consumption Rates

ELSEWHERE in this issue there appears an abstract of a report dealing with the relative rates of coal consumption of various utility and industrial plants. Altogether seventy-three stations were analyzed, a number not sufficient perhaps to be truly

representative of conditions, yet sufficiently so to demonstrate a number of salient facts.

As is to be expected, the larger power plant, generating electricity, is able to deliver a horsepower-year on a lesser coal consumption than the smaller plant. The survey of seventy-three plants, ranging from 650 to those over 100,000 kw. shows that the coal consumption changes from 25.1 tons and higher for the former to 6.25 tons for the latter. For stations above 100,000 kw. the coal consumption per horsepower-year was found to remain practically constant, indicating that with present practice coal consumption cannot apparently be lowered much below 6.25 tons of coal per horsepower-year capacity. While stations of 50,000 horsepower cannot be called "super-stations" in any sense of the meaning, such plants are sufficiently large to show a marked improvement in coal economy over plants but half their capacity. This is fortunate, in a sense, since there is greater opportunity for stations of 50,000 kw. and thereabouts than is the case for stations of 100,000 kw. and above.

Another salient fact shown in the report is the influence upon coal consumption of the load-factor. In all cases stations with the higher load-factors show the lower coal consumption, a fact well appreciated. However, the report serves to emphasize the importance of developing load with the view to improving the load-factor.

Let Workmen Help Develop Foreign Trade

THE prospect of an early peace brings to the front the prophesied unparalleled activity in export trade and with it certain anticipated labor questions. To obtain this export business is easy for the American manufacturer now, but to retain it, in the face of the competition which is sure to develop, will prove much harder. This will depend principally upon the quality of the products that are sent to the foreign markets now. There are men who claim we are as unprepared for peace as we were for war and, although this can be easily disputed, it is hoped that when the time comes that the American manufacturer must meet competition in the foreign trade field there will be no opportunity to question his preparedness.

To insure this we must begin now to make the products which we offer to this trade unquestionable as to their quality. It must be remembered that these articles will be judged much more exactly abroad than at home and the little defects which frequently arise and are easily remedied here will cause not only considerable expense and trouble but also give an unfavorable impression which is all too lasting when they occur on devices in use abroad. Not that we should make any better articles for foreign trade than for home use, but we must seek to right the little difficulties at the factory which are often not corrected until they are on the job now. For example, many manufacturers are often required to send men from the factories to fix little defects that arise after the machinery or other device is in use a short time. This trouble is usually of a trivial nature which, when repaired and explained to the purchaser, is understood as such and consequently instead of criticising the device, he praises the company for its service in correcting it. The same trivial defect occurring in use abroad, where it may take weeks to even reach the manufacturer, let alone to correct it, will undoubtedly tend to cause the purchaser to look with suspicion upon all products of that factory.

To point out the many and varied ways to insure against these defects is as impossible as to make an infallible article. There is one fact, however, which is seldom given consideration but which the war has brought out very forcibly. That is the advantage of letting the employe know, wherever possible, where and by whom the article or apparatus on which he is working will be used.

Many manufacturers resort to every possible means to secure the co-operation of their employes, but refrain from taking them into their confidence in even such slight matters as this, which is one of the surest ways of securing this co-operation. The average workman if he knows that the machine he is working on will be used in some foreign or prominent place will take a much keener interest in the machine and strive to make it a credit to both the company and himself. The knowledge that the apparatus on which he is working will when completed be an integral part of a plant in some war-stricken city or that it will be used in the construction of some famous undertaking he may have read about should be as interesting to him as the use for which it is intended.

This was especially proven by the wonderful developments during the war period. Although the leaders of our industrial enterprises justly deserve a large amount of the credit for this development, American labor also should be given considerable credit. Undoubtedly the manner in which labor accepted and completed its share of the task was largely due to patriotism, but had the knowledge that they were working for a patriotic cause been withheld from them it could not have been accomplished as easily as it was, if at all. Furthermore, the American mechanic is inherently loyal as well as patriotic and if given the opportunity will prove it.

If but a small portion of the interest and enthusiasm which was displayed by labor in our war activities can be retained in our peace industries, many of the anticipated labor troubles will not arise. This can best be accomplished by explaining the importance to labor as well as to the country as a whole of developing our foreign trade, and by manufacturers placing confidence in their employes to help develop it. This method of informing them as to where their products will be used is therefore at least worthy of a reasonable trial.

Week's Events

Readjustment Plans of the War Industries Board—Conservation Lessons Discussed—Electric Vehicle Men Meet

READJUSTMENT PLANS OF WAR INDUSTRIES BOARD.

Full Text of Bulletin No. 2 of Electrical and Power-Equipment Section.

Bulletin No. 2 of the Electrical and Power-Equipment Section of the War Industries Board dealing with readjustment plans has been issued. The full text of Bulletin No. 1 of the section was published in the last issue of the ELECTRICAL REVIEW. This bulletin briefly outlined the plan which the War Industries Board would follow in releasing from the war restrictions. Bulletin No. 2, the full text of which is as follows, contains more definite information regarding many branches of the industry.

PRIORITIES AND PREFERENCE LIST.

The Priorities Division have prepared for printing Circular No. 58 which probably will not be ready for enclosure herewith but may be briefly summarized as follows.

Preference list and all supplements thereto are cancelled as of Nov. 22. All specific and automatic priorities are cancelled as of Nov. 22, save those in favor of the Navy, the Emergency Fleet, the United States Railroad Administration, telegraph and telephone companies. Also where exceptional necessity is shown, after careful investigation, specific priorities, other than those mentioned above, may be issued.

You are, therefore, permitted to accept orders and make deliveries of all classes of apparatus and for any purpose where such deliveries are not in interference with priority orders on your books for the agencies mentioned above, and to readjust your schedules according to your own best interests. Attention is called to the fact that the cancellation of priorities does not cancel the order.

PLEDGES.

By virtue of the fact that the preference list has been abolished, you are hereby entirely released as to pledges addressed to the Priorities Committee.

A number of industries coming under the direct supervision of this section have been working under various degrees of curtailment by virtue of circulars issued by the Priorities Division. These are as follows: The vacuum cleaner industry, washing machine industry, electric heating appliance industry, and the fan motor industry. You are hereby advised that all restrictions are now lifted and that your pledges filed in accordance with the provisions of such circulars are cancelled.

Circular No. 23, affecting jobbers and dealers, is hereby cancelled and withdrawn.

MONTHLY REPORTS.

We suggest that you prepare your P. C. Form No. 21 for November, and, as stated in Bulletin No. 1, maintain your own machinery for preparation for similar report for December, if wanted. We cannot now see that the information for November will be useful to us; therefore suggest that you do not mail it unless we find a necessity later on. This is in line with our desire to refrain from seeking unnecessary information, and, of course, applies only to those industries under your jurisdiction which were under that system.

OUR FUTURE DUTIES.

We are proceeding with all possible speed to review our files, put them in shape for future reference, to make explanations in connection therewith where it seems necessary, and in writing the history of our activities. We shall still probably be called upon for some service in connection with the various Government agencies in connection with cancellations or tapering-off programs. So far as we can see, when this work is finished, we are finished. In the meantime, if we can perform any service for you, please call on us.

CONSERVATION.

Positions with reference to general conservation and standardization are now quite as expressed in Bulletin No. 1; that is, schedules will not be promulgated from here except upon specific request from each War Service Committee having the schedule in charge. In the absence of request, we will understand that the schedule is not to be promulgated.

The War Industries Board, however, fully recognizes the desirable nature of many features of the programs of conservation and standardization which have been prepared, believing that a thoroughgoing standardization of our industries will have a far reaching effect on international competition through providing a basis for organization of such industries on a national scale. In this connection it will be of interest to quote the following paragraphs from a recent statement by Mr. Baruch.

Discussing the matter of conservation and standardization, Mr. Baruch called attention to the opportunity which exists for the country to make of a matter of necessity a matter of advantage. The various measures undertaken, he observed, had been projected and carried through under the stress of the war program—each measure taken up with the individual industry involved, and no attempt made to establish a general policy. The results achieved even in that way, he declared, justified, in his belief, a suggestion that the whole subject should be transferred to one of the permanent agencies of the government. Properly conceived, he declared, a policy of industrial conservation and standardization in time of peace would make for a saving in material, money and labor, and a consequent increase in productive capacities. Standardization of types and styles in various classes of commodities, he said, would make for cheaper costs of production, and, resulting therefrom, lower prices to the

consuming public. The possibilities from such economies, he remarked, constituted one of the great lessons learned from the war.

At this point the Chairman took occasion to pay a warm tribute to the "spirit of service," which, he said, possessed to an unvarying degree by American industry in the period of the war, had made the war industries organization of America greater than that of any other country. Each industry, he said, considered itself to be fighting Germany. He relied on a similar spirit to see the country safely through the period of transition.

Reconstruction Work in Belgium.

Mr. Baruch announced that George N. Peek, Commissioner of Finished Products of the War Industries Board, had been delegated to represent the War Industries Board in its dealings with Herbert Hoover in the latter's demands for materials needed for the reconstruction work in Belgium. Mr. Peek's headquarters will continue to be in Washington.

Steam Condensers—Surface Type.

On Sept. 9, all manufacturers of surface-type steam condensers were notified that the manufacture and distribution of this apparatus was to be controlled and regulated by the War Industries Board. The reasons which made such action necessary no longer exist, and the restrictions set forth in our letter of that date are hereby removed.

Power Equipment—Shipping Schedules.

The manufacturers of boilers, heaters, condensers, stokers and other power plant apparatus may discontinue mailing shipping schedules and corrections thereto to this section of the War Industries Board; but it is suggested that the manufacturers themselves continue to make up these records for their own use, and for ready reference in case this Board needs the information contained therein to carry out whatever program of cancellation or redistribution, may be determined upon.

Maximum Prices.

It has been decided that all maximum prices promulgated by the Price Fixing Committee will remain in force for the periods originally contemplated. At expiration, each case will be considered individually, and, where justified by conditions then existing, price control may be retained on the present or on a modified basis, or may be withdrawn completely.

Restrictions on Buildings.

All restrictions as to buildings and construction work of any nature have been withdrawn today.

Steam Turbines.

On May 31 all manufacturers of steam turbines of 500 kw., or larger, were notified that the manufacture and distribution of this apparatus was to be controlled and regulated by the War Industries Board. The reasons which made such action necessary no longer exist and the restrictions set forth in our letter of that date are hereby withdrawn. As stated above, under the caption "Priorities," manufacturers will proceed to readjust their production schedules according to their own understanding of the relative importance of their various orders, keeping in mind only priority for the four agencies named.

CONSERVATION LESSONS OF THE WAR DISCUSSED IN CHICAGO.

Joint Meeting of Technical Societies of Chicago Considers Conservation of Light and of Coal.

Important lessons in the way of conservation necessitated by war conditions were brought out at a joint meeting of sections of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, Illuminating Engineering Society, Western Society of Engineers and other organizations, that was held in Chicago on the evening of Nov. 25. R. F. Schuchardt acted as chairman. Preceding the meeting proper a moving picture entitled "Coal Is King" was shown, which contained valuable educational information on coal conservation.

The first paper presented was by Preston S. Millar, of New York City, on the subject, "Lighting Curtailment." Lighting in wartime, aside from that for military purposes, he said, could be discussed chiefly under four heads: (1) promoting production, (2) protective lighting, (3) promoting safety, and (4) conservation of light. Respecting the first, the influence of lighting on production in industrial plants was not fully appreciated by the public nor by manufacturers. This matter was well brought out in the recent paper by W. A. Durgin (see reprint in the Electrical Review of Nov. 2, 1918.) It was shown that production could be increased an average of 15% at a cost of about 5% of the payroll. Mr. Millar pointed out the need for thorough consideration of all of the elements of satisfactory lighting, including proper intensity, direction and diffusion of the light. The lighting provided in most of the war industries consisted of equipment of the better type and considerable advance in lighting practice resulted. The importance of industrial lighting was recognized by the Fuel Administration by refraining from insisting on curtailment of lighting in this line.

Early in the war it was necessary to take up the subject of protective lighting to overcome the plots of enemy agents against military and industrial plants engaged in war work. The Committee on War Service of the Illuminating Engineering Society drew up a set of suggestions on protective lighting which were later published in the form of a pamphlet by the War Department. Plans for such lighting were made for a number of Government plants. It was a general experience that provision of good protective lighting meant a decided reduction in the number of guards needed.

As to lighting in promoting safety, Mr. Millar referred to the paper by R. E. Simpson, presented before the recent convention of the I. E. S. in which he showed that as compared with 1910, lighting practice had improved to such an extent that the number of accidents due to poor lighting was reduced from 23.8% to about 18%. Even at this, the industrial accidents due to lighting deprived the country of the services of 108,000 men per year.

In the way of conservation of light, the committee referred to took an active part in considering the various lighting-curtailment orders. It was shown that daylight saving did not save nearly as much coal as was anticipated; in fact, all of the various lighting-curtailment measures effected relatively small savings of coal, though they were very effective psychologically, especially as to sign lighting. When the sign-lighting restrictions were removed last April a general protest was raised by the public, but when the order

was later restored, merchants sought to have sign restrictions relieved because of serious loss of business. In New England, on account of the very acute coal shortage, lighting curtailment was carried to extremes and it was found that coincidentally an increase of accidents was reported. Although agitation for further curtailment was indulged in, the War Service Committee showed the unwisdom of indiscriminate curtailment. Suggestions were made as to the use of improved lighting methods for getting a higher efficiency from equipment by use of reflectors, frequent cleaning of units, painting of walls and ceilings, etc. The manufacture of inefficient carbon-filament lamps was restricted and also their renewal by central stations. To meet the need for a more robust type of Mazda lamp that could replace carbon lamps in places subject to vibration, a new type is being developed which may be introduced in a few months.

A pamphlet on wartime lighting economies was prepared by the committee and is being circulated by the society. The lighting companies have stood the heavy burdens of the war very admirably and the National Committee on Gas and Electric Service was held in high esteem in Washington on account of the valuable advice and service which it freely rendered to the country. It was early shown that electric lighting requires a coal consumption of only about 12,000,000 tons a year, of which only a small part could be saved through lighting curtailment. On the contrary, it was shown that some 25,000,000 tons annually was wasted in domestic heating alone. However, the importance of effecting coal conservation in every way was recognized by lighting men and they cheerfully helped all that was within their power, especially by showing how conservation could be effected wisely.

Harold Almert, director of conservation for Illinois of the Fuel Administration, gave a talk on "Conservation of Coal During War Times in the State of Illinois." He referred to the many problems of conservation that had come to his notice, including the promotion of increased mining and coal shipment, the interconnection of power systems and plants, the introduction of the "skip-stop" system on traction lines, the educational work among firemen of high-pressure plants with equipment as now installed, the changing over of industrial plants using anthracite coal to other kinds of fuel, conservation of oil, problems connected with the use of coal in domestic heating, lighting curtailment, economies in refrigerating plants, hotels, office buildings, etc.

Among points brought out was that in Illinois there was an abundance of screenings which were being produced at the rate of 1,000,000 tons surplus monthly. Merchants protested against the restriction of window-display lighting, one merchant alone stating that he had lost no less than $12,000 business a month through inability to light his windows by day. Considerable trouble was experienced from fires through spontaneous combustion in stored coal; an ordinance formerly requiring wetting of the coal before being put into basements was found to lead to a considerable number of fires. In the city of Springfield, Ill., the municipal electric plant, which is an efficient steam-turbine plant, was ordered shut down during the winter so that the utility company's plant could carry the entire load and obtain better operating conditions for its district-heating system; serious opposition was met with in the community on this account. The various state fuel administrators have been asked to continue the fuel-conservation work another year to insure that another fuel shortage will not develop.

CHICAGO ELECTRIC CLUB CONSIDERS PERMANENT QUARTERS.

Plan Presented for Club House—Officers for 1919 Nominated—Name Changed.

At the meeting of the Electric Club-Jovian League of Chicago on Nov. 21 a report of the Permanent Quarters Committee was presented by W. H. Coleman, chairman, outlining a plan whereby the club could secure permanent quarters. Action on the report was deferred until all members could be acquainted with the plan. One thousand resident members paying $20 per year dues are required.

The club voted to eliminate "Jovian League" from its name and hereafter will be known as The Electric Club of Chicago.

The report of the Nominating Committee was presented, the following being the nominees for office for 1919:

President, H. A. Porter, president H. A. Porter, Inc.

First vice-president, William H. Hodge, publicity manager, H. M. Byllesby & Co.

Second vice-president, C. W. PenDell, power engineer, Public Service Co. of Northern Illinois.

Secretary-treasurer, H. V. Coffy, assistant publicity manager H. M. Byllesby & Co.

Trustee, Charles H. Roth, president Roth Brothers & Co.

CHICAGO ELECTRIC VEHICLE MEN MEET

Need of Emergency Charging Stations Discussed Among Other Interesting Topics.

The latest meeting of the Chicago Electrical Vehicle section of the National Electric Light Association was held Nov. 26, at the Hotel Sherman, Chicago. At this meeting many suggestions for the development of the electric vehicle business were brought out and discussed. The majority of these suggestions concerned the bettering of charging service conditions in the city.

Although much better equipped than the average city in this respect there is still a woeful lack of emergency charging stations in Chicago. This condition undoubtedly retards the use of this class of vehicles and it is the intention of the section to exert every effort to improve it. They have already accomplished a great deal in this respect, especially in the territory immediately outside of the business district and a movement is now on foot to establish one or more new stations inside this district if possible either on or adjacent to one of the boulevards.

In spite of this and other adverse conditions, however, the growth of the electric vehicle business in Chicago has been very steady and the future looks especially encouraging for both the pleasure car and truck.

ELECTRIC WELDING IN ITALY.

Electric welding is finding favor in Italy, and a recent exhibition was held to encourage the use of electricity instead of the oxy-acetylene flame. Italy has large quantities of hydroelectric power, with much water power as yet undeveloped. Electric welding will diminish the consumption of calcium carbide which is expensive and requires transportation facilities. From every aspect welding electrically is advantageous.

RESULTS PROVE WIRELESS VALUABLE FOR POLICE COMMUNICATION.

Several Instances Showing Prompt Results Obtained by This Method.

The success which has been achieved by the installation of wireless equipment in the Marine division of the New York police department has caused tentative plans for its extension to a larger number of inspection districts to be drawn up. This system, which was inaugurated a few years ago, now consists of three stations. One of these is installed at the headquarters building at Manhattan, another at Brooklyn and another on the police steamer *Patrol*. During the war these stations aided both the federal and municipal authorities to a great extent in the prompt delivery of reports. This is especially true of the detailing of the *Patrol* and in many cases has saved considerable property and possibly many lives.

A few of the instances in which this prompt dispatching has proven valuable are related herewith.

On one occasion two barges broke away from the pier at the foot of East 54th street, and, driven by a strong wind and tide, swept up the East river and carried three more away from the pier of East 70th street. The five then drifted out through Hell Gate, in the path of the fleet of steamers that come in through Long Island sound early every morning. The *Patrol* was off Staten Island when this information reached headquarters and was notified by wireless about 4 o'clock. At 5:35 a. m. it reported by wireless that four of the barges had been caught and docked by the police boat and that the fifth was taken in charge by a tug.

At 9:40 p. m., some time later, Harbor A was notified by the pier watchman that a lighter had broken away from the West 30th street pier and was drifting up the river. The *Patrol*—off the Statue of Liberty—was notified, and at 10:15 p. m. reported by wireless that the lighter, carrying a cargo of coffee valued at $50,000 had been returned to the pier.

Showing the prompt service possible with this wireless equipment at 5:25 p. m., a report was received at

School of Radio Instruction of New York Police Department.

the Brooklyn headquarters that a party in a row-boat off Coney Island were being carried out to sea. The Brooklyn wireless operator forwarded the report to the *Patrol*, which started for the scene. Seven minutes later, at 5:30 p. m., the Brooklyn station was notified that the boat had been picked up, which information being wirelessed to the *Patrol*, prevented an unnecessary trip of several miles.

The steamer *Patrol* has also met at Jersey City and brought to New York each of the seven foreign commissions that have visited this country on official business during the summer, and the wireless equipment of the department on these occasions has been a valuable means of keeping the city officials in close touch with the movements of the parties. If the special train bringing the commission reached Jersey City at a time other than expected, headquarters was immediately notified by a wireless message from the boat which was waiting at Jersey City railroad pier, and the information telephoned to the officials who were interested. When the party boarded the boat, a wireless message to headquarters was telephoned to the inspector in charge of the line of parade, so that the route could be cleared in time but with least interruption to regular traffic. Headquarters was also notified by wireless when the party disembarked and the parade started.

In connection with this part of its communication system, the department maintains a school of instruction in wireless operation. This school, a room of which is reproduced herewith, is complete in every way and the course of instruction is very thorough.

NEW YORK ELECTRICAL SOCIETY MEETS.

G. Douglas Wardrop Addresses Members on Future of Aeroplane.

The 368th meeting of the New York Electrical Society was held Nov. 19 in New York City. The members on this occasion were addressed by G. Douglas Wardrop, editor of *Aerial Age*, upon the subject, "War Aviation in Retrospect; Commercial Aviation in Prospect." The meeting was presided over by A. L. Doremus, president of the society.

Mr. Wardrop, who recently returned from an investigation of the aerial developments abroad, was very optimistic regarding the future of aviation. The war, although it has done much to bring out the possibilities of the aeroplane, has restrained the commercial development of it to a certain extent. In many foreign countries, especially Italy, as well as in this country, progress is now being made in this phase of their development more rapidly than ever and the next year should bring out many radical changes in transportation on account of the increased use of the aeroplane.

LIMIT OF BITUMINOUS COAL STORAGE LIFTED.

All storage restrictions on bituminous coal have been removed by the United States Fuel Administration in conformity to the action of the War Industries Board in cancelling its preferential industries list. Anthracite coal is not affected, however, by the ruling of the Fuel Administration.

Every industry and every householder in the country may now store as much bituminous coal as desired or obtainable, as the action of the War Industries Board removes the necessity for the Fuel Administration to distinguish longer among different classes of industrial plants.

The restrictions just raised provided for the accumulation by the consumers in the preference classes defined by the War Industries Board, of reserve stocks of bituminous coal, in accordance with their location in relation to various mine fields and their classification on the preference schedule.

Commercial

Methods of Ventilating Show Windows to Prevent Frosting —New Addition of Electric Shop of Edison Company

PROPER VENTILATION PROTECTS SHOW WINDOWS FROM FROST.

Two Methods Which Permit Winter Displays.

By C. A. Gauss.

Jack Frost has already made his appearance, rendering ineffective many result-producing window displays. Few things are more discouraging to an electrical dealer than putting in considerable time and labor upon a window display and then have the glass frost over so that all or a good part of this display is not visible. There are a number of preparations on the market designed to prevent show windows from frosting, but the most efficient and desirable way is to thoroughly ventilate the windows.

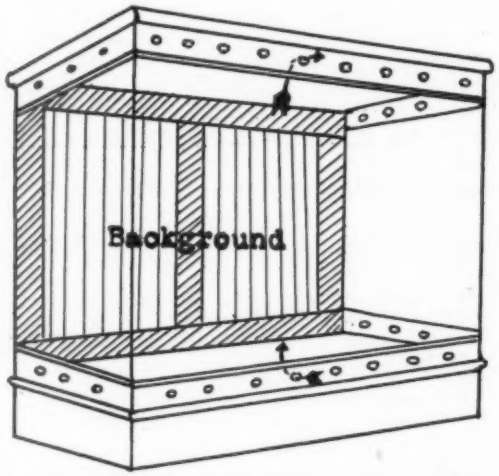


Fig. 1.—Method of Ventilating Show Windows to Prevent Frosting.

In order to prevent frosting in this way it is first necessary to build a background clear from the floor of the window to the ceiling and as air-tight as possible. A solid paneled-wood background may be built or the back of the window may be boarded up for a distance of about 6 ft. and the upper half of the background made up of glass windows that will permit light to enter the store from the front. Where rough boards are used they should be covered with muslin, cambric or crepe paper. If a painted background is preferred, the muslin should be separated into small panels by pieces of molding and the panels calcimined or painted any desired color. Backgrounds of finished hard wood are also often used and make a very attractive appearance.

After an air-tight background has been built the ventilating system can be installed. If the window glass is set in a heavy frame with the floor of the window several inches below the lower edge of the glass, as shown in Fig. 1, the window can be ventilated by boring a number of holes along the frame at both top and bottom, as shown in the illustration. The cold air will enter the bottom holes and the warm air will pass out at the top, causing a continuous circulation of air. The temperature will then be the same on both sides of the glass, making condensation and consequent frosting impossible. The holes should be covered with a fine screen to keep out the dust.

In cases where the show windows are of the older type with the floor of the window on the same level as the lower edge of the glass, ventilation may be secured by the scheme illustrated in Fig. 2. Holes should be cut in the wall under the glass and in the floor of the window just inside the glass and a piece of tin tube or stove pipe used to conduct cold air through these holes into the window. Holes should then be bored in the wooden frame at the top of the glass as in the former case. All holes should be covered with a wire screen to keep out dust. Cheese-cloth may be used as a floor covering where this elbow scheme of ventilation is used without interfering with the circulation of air. Floor coverings of paper, muslin, etc., however, cannot be used in this case as air cannot pass through these materials readily.

Some electrical dealers may hesitate to prevent frost on their windows in this way because it calls for an inclosed background to which they are not accustomed. It is, however, through the use of such backgrounds that the most attractive displays can be arranged. They also possess the additional advantage of keeping the goods on display free from dust. Where light through the show window is required to illuminate the store during the day, it will be found that where the solid background is only carried up for a height of about 6 ft. and the upper part completed with glass windows, sufficient light will enter the store for most purposes.

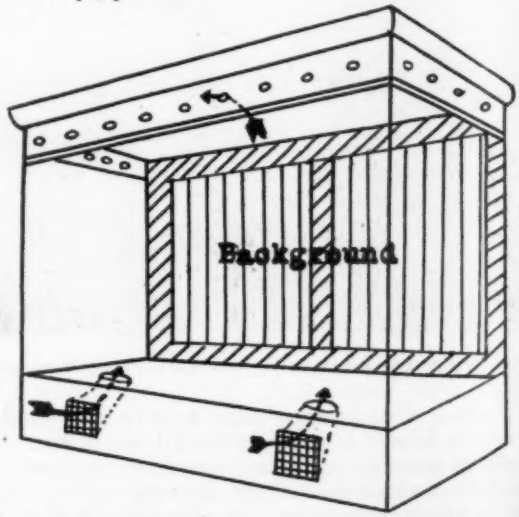


Fig. 2.—Another Way to Ventilate Show Windows.

ELECTRIC SHOP, CHICAGO, INCREASES FLOOR SPACE.

New Addition, Second in Three Years, Includes Valuable Space—Policies Which Have Made This the Largest Store of Its Kind.

The recent addition to the Electric Shop of the Commonwealth Edison Co., 72 West Adams street, Chicago, insures its place as the largest electrical merchandising store in the country. This addition of

View of the Edison Building, Chicago, the Corner Store of Which Was Recently Added to the Electric Shop.

6000 sq. ft. increases the actual selling space of this shop to approximately 15,100 sq. ft., which comprises about 85% of the entire first floor of the magnificent 19-story building of the company. In addition, practically the whole basement of the building is utilized as a storeroom and the office of the store is located on the eighteenth floor. In passing, it may be of interest to note that this company and its associated companies occupy nearly the same proportion of the entire building, i. e., 85% of it.

The latest addition, the second in the three years that the shop has had at this address, is especially valuable inasmuch as it includes the corner of the building facing both Adams and Clark streets, two of the principal business streets of the city. Another advantage which it possesses is that it will permit a direct entrance to the store from the street. Formerly the shop was entered through the lobbies of the building, which proved rather confusing to strangers. An elaborate entrance is now being constructed at the corner of the building.

The new space will be devoted to the display and sale of appliances and small accessories. The space formerly occupied by this stock will be used for a greater display of ornamental and portable lamps of all kinds. Contrary to the usual custom, no display windows will be built in the additional space. Instead large plate glass windows will be put in, affording the passer-by a view of the entire shop. The composite display thus affected by the stock of appliances in the foreground and the complete array of ornamental lamps, a number of which are always lighted, in the background will undoubtedly prove very enticing to the casual shopper. The present large show windows will remain for the display of special features.

The growth of the Electric Shop can be chiefly attributed to the progressive methods of its management and its policies towards its customers. Since its inception a sincere effort has been made to handle only quality products, which it could safely recommend to purchasers and at a price which would make them attractive. Always progressive, new methods, designs and appliances were quickly adopted and, in addition, numerous new designs and improvements were created.

Soon after the new store was started it was noticed that there was an ever-increasing demand for the non-electrical appurtenances of the many electrical appliances. In response to this demand a very modest line of glassware was installed, partly for use as fixtures in displaying stocks and partly to satisfy the demand for them by purchasers of electrical goods. This stock was quickly disposed of and since then the growth of this part of the business has been very rapid. The extent of this business at present is realized from the fact that the sales from silk shades alone amount to about $100,000 a year. However, no attempt has been made to emulate the department store and the only non-electrical stock carried is that which is associated directly with some electrical apparatus.

The present manager of the Electric Shop, E. A. Edkins, is responsible to a great extent for its success and growth. The sales force at present numbers 55, including a number of salesladies who were added during the shortage of men and have proven very efficient at this work. In addition, there is a sizeable office and stockroom force.

ELECTRIC RAILWAY ASSOCIATION HOLDS FALL MEETING.

The Central Electric Railway Association opened its fall meeting at the Hotel Lincoln in Indianapolis, Ind., Nov. 21. The attendance was smaller than usual due largely to the influenza epidemic and to post-war conditions. Those members present, however, said that the meeting would be highly important nevertheless owing to the discussion of important after-the-war financial problems relating to the electric railway business. A paper prepared by A. X. Swarts, vice-president of the Toledo & Western Railroad Co., on the subject of a proper fare basis for interurban lines was read, Mr. Swartz being unable to attend the meeting. An allegory advocating the necessity of universal safety precautions was presented by R. N. Henning, superintendent of transportation of the Fort Wayne & Northern Indiana Traction Co. Mr. Henning also delivered an address on the subject, "The Preservation of Humanity." Harry Reid, of Louisville, Ky., president of the Interstate Public Service Co., discussed various general problems of interurban lines.

Operating

Fuel Saving Suggestions By Mail—Illumination of Battery Rooms—Street Lighting Schedules for December

HELPING POWER PLANTS SAVE COAL BY MAIL.

Directions and Data for Reducing Radiation Losses.

The fifth weekly letter sent out to Illinois power plants by Joseph Harrington, administrative engineer, United States Fuel Administration, deals with radiation losses—how to reduce them. A number of tables giving radiation losses and their cost, cost of heat-insulating coverings, etc., are appended.

RADIATION LOSSES FROM STEAM-HEATED SURFACES.

"By steam-heated surfaces, we mean drums or shells of boilers and steam piping such as boiler feed lines, hot water returns, and the like.

"This is one of the most easily accounted for losses in the power plant and it is one for which no excuse can be given. The cost of covering steam pipe is so quickly made up by the saving which results therefrom that uncovered piping or parts of the boiler should not be tolerated for a single day.

RADIATION LOSSES.

A sq. ft. of ordinary bare pipe will radiate approximately 3 B.t.u. per sq. ft. per hr. per degree difference between the temperature of the pipe and the outside or room temperature. A properly covered pipe, however, radiates only about 0.3 B.t.u. per sq. ft. per hr. A convenient table giving the lengths of pipe of various sizes per sq. ft. of outside surface follows:

TABLE A.

Pipe size. dia. in.	Length of pipe in ft. per sq. ft. of external surface.	Length of pipe in in. per sq. ft. of external surface.
1	2.9	34-13/16
2	1.6	19- 7/32
3	1.0	12
4	0.84	10- 3/32
5	0.68	8- 3/16
6	0.57	6-27/32
8	0.44	5- 9/32
10	0.35	4- 7/32

"To give an idea of what it means to have uncovered steam and hot water piping, a table is given herewith. All you have to do to find out how much coal you are wasting is to determine the steam pressure or hot water temperature, measure the amount of uncovered surface, and multiply the square feet of uncovered surface by the figure in column No. 5, which corresponds to the steam pressure. For example, when the steam gauge shows 100-lb. pressure there is a waste of 718 lb. of coal per year for every square foot of exposed pipe.

TABLE B.

Ordinary Steam Temperatures—Temperature of Surrounding Air 70° F.

1. Steam pressure (gauge).	2. Steam temperature (° F.).	3. Temp. difference of steam & surrounding air (° F.).	4. Loss per sq. ft per hr. B.t.u.	5. Waste of coal in lb. per sq ft. per yr.	6. Sq. ft. of surface that wastes 1 ton of coal in 1 yr.
0	212	142	334	293	6.82
10	240	170	425	372	5.38
25	267	197	522.5	458	4.37
50	298	228	644	564	3.55
75	320	250	737.5	646	3.10
100	338	268	820	718	2.79
150	366	296	960	840	2.38
200	388	318	1079	945	2.12
250	406	336	1184	1036	1.93

Temperatures Lower Than 212° F.

1. Water temperature (° F.).	2. Difference between water temperature and surrounding air (° F.).	3. Heat loss per sq. ft. per hr. B.t.u.	4. Waste of coal in lb. per sq. ft. per yr.	5. No. of sq. ft. of surface that wastes 1 ton of coal in 1 yr.
100	30	56.6	49.6	40.3
120	50	97.5	85.4	23.4
140	70	142	124.3	16.1
160	90	190	166.3	12.03
180	110	242	212.0	9.44
200	130	298.5	261.5	7.65

"There are a number of excellent materials readily obtainable for covering steam piping and boiler drums. Will you please, therefore, without delay, make a detailed examination of your piping, list the various sizes and lengths of the exposed pipe, and place the order at once for the necessary covering? I will ask you, also, to write a letter to me, with a copy to your district chairman, within one week of the receipt of this letter, stating whether you have taken the necessary steps for the covering of your piping and advise me when the piping will be covered, if it is not now.

Prices of Magnesia Pipe Coverings—For Conveniently Estimating Cost of Work.

1. Inside dia. of pipe, in.	2. Thickness of standard covering in in.	3. Price per lin. ft., canvas jacketed.	4. Thickness of covering in in.	5. Price per lin. ft., canvas jacketed.
1	7/8	$0.27	1½	$0.52
2	1-1/32	0.36	1½	0.64
3	1-1/32	0.45	1½	0.76
4	1-1/8	0.60	1½	0.88
5	1-1/8	0.70	1½	1.00
6	1-1/8	0.80	1½	1.10
8	1-1/4	1.10	1½	1.35
10	1-1/4	1.30	1½	1.65

"A table of approximate cost of magnesia covering is given for your convenience in figuring the probable cost of your work. The cost of this work is the initial cost only, because pipe covering will remain in place indefinitely, unless it is deliberately destroyed. Here we have the means of a direct and inexpensive economy which I know you will not fail to avail yourself of."

FLOOD LIGHTING FOR STORAGE BATTERY ROOMS.

Ample Illumination Thus Obtained Without Dangers and Expense.

In lighting storage battery rooms the danger of explosion has to be borne in mind at all times. The danger of explosion is due to the formation of an explosive mixture resulting from the liberation of hydrogen and oxygen during the charging. Special precautions are therefore usually taken against this hazard, by endeavoring to prevent sparks or naked flames from occurring and by having ample ventilation in the battery room so that there is sufficient change of air in the room to prevent an explosive mixture from forming.

Another fact to be borne in mind in storage battery rooms is that there is every opportunity for corrosive action. The fumes given off by the storage battery contain sulphuric acid. Sulphuric acid is hygroscopic —that is, absorbs moisture, thus tending to accelerate corrosion of iron, steel and copper parts, rubber, etc., in the battery room. This fact makes it necessary that lighting circuits and fixtures in storage battery rooms be properly protected, which means additional expense.

To eliminate the possibility of explosion from the occurrence of a naked flame or spark in a battery room containing an explosive mixture, special precautions are usually taken by keeping the door of the room locked, forbidding the use of matches, torches, lights, etc., in the room until special precautions have been taken. However, these measures seem to remove the effect rather than the cause. Some companies having large storage battery rooms do not install lights at all, but have lights taken into the battery room only when needed, connected by means of flexible cords to receptacles installed in the room.

Flood lighting has recently been suggested as the best all-round way to light a storage battery room. Around the battery room, at the proper height, or on the ceiling in some cases, glass would be installed. In the walls or in the ceiling behind this glass a number of lamps would be placed and connected to sockets supplied by conductors in conduit run in the walls of the battery room structure away from acid fumes or acid seepage. In this way there would be no likelihood of explosion, and corrosion need not be feared. Moreover, if this method of lighting battery rooms were employed before a battery room or house were built, it would probably be found that this method of lighting would be cheaper than where exposed fixtures and conductors of special design are used.

Illumination in storage battery rooms is not used very frequently, but the corrosion goes on continually. On the other hand, when lighting is needed, it should be good, safe and reliable. The flood lighting of storage battery rooms fulfills all the requirements of safety, economy and application.

COAL SAVING BY INTERCONNECTION.

Coal saving at the rate of 5000 tons a month has been effected by six power companies of Eastern New York through the operation of a plan of joint operation and the use of water power heretofore wasted, undertaken at the suggestion of the Fuel Administration. This record in coal conservation was effected without a change in existing equipment or additional cost to the power companies, and the success of the plan has been so marked that the companies interested are anxious to continue it.

The companies which combined and carried out the plan through a joint committee made up of their regular organizations, serve what is known as the "Capital District," including the cities and towns of Albany, Troy, Schenectady, Amsterdam, Mechanicsville, Cohoes, Saratoga, Glens Falls and adjacent territory. In the hands of the joint operating committee and using the available resources of the six power companies, a two weeks' test was begun on Oct. 23. In that period electric energy equal to that generated by the burning of 2450 tons of coal was developed from existing equipment, and the natural river flow which otherwise would have gone to waste. The generating companies were thus able to market heretofore unused power, and the coal-burning companies were able to get power at a saving over their own costs.

The following companies are co-operating in the joint operation plan:

Adirondack Electric Power Corporation, Cohoes Power Co., General Electric Co., Hudson Valley Railroad Co., Municipal Gas Co., and Schenectady Power Co.

In carrying out this program of joint operation, the power companies used interconnecting transmission lines which were already in existence, having been installed some years ago as a protective and emergency measure.

Street Lighting Schedules for December.

Every plant operating street lighting circuits must have a definite schedule for lighting and extinguishing the lamps. Below are given the two most commonly used schedules as compiled for next month. The table is compiled for latitude 40° North. The table gives the time in mean local or solar time, which can readily be changed to standard time.

DECEMBER, 1918.

Night of Dec.	All-Night Schedule. Light.	Extinguish.	Moonlight Schedule. Light.	Extinguish.
1	5:05	6:35	5:05	6:05
2	5:05	6:35	5:05	6:05
3	5:05	6:35	5:05	6:05
4	5:05	6:35	5:05	6:05
5	5:05	6:35	5:05	6:05
6	5:05	6:40	6:20	6:10
7	5:05	6:40	7:25	6:10
8	5:05	6:40	8:30	6:10
9	5:05	6:40	9:35	6:10
10	5:05	6:40	10:45	6:10
11	5:05	6:40	11:55	6:10
12	5:05	6:45	1:05	6:15
13	5:05	6:45	2.15	6:15
14	5:05	6:45	3:30	6:15
15	5:05	6:45	4:40	6:15
16	5:05	6:45	No light	
17	5:05	6:45	No light	
18	5:05	6:45	5:05	6:35
19	5:05	6:45	5:05	7:45
20	5:05	6:50	5:05	8:50
21	5:10	6:50	5:10	9:55
22	5:10	6:50	5:10	10:55
23	5:10	6:50	5:10	11:55
24	5:10	6:50	5:10	12:55
25	5:10	6:50	5:10	1:50
26	5:10	6:50	5:10	2:50
27	5:10	6:50	5:10	3:45
28	5:10	6:50	5:10	4:45
29	5:10	6:50	5:10	5:40
30	5:15	6:50	5:15	6:20

Contracting-Construction

Scientific Estimating Making Progress—Standardizing Outlet Business—Wiring Kinks—Among the Contractors

ESTIMATORS TEACH CONTRACTORS PRINCIPLES OF SCIENTIFIC ESTIMATING.

Procedure in Estimating, Use of Labor Units, and Standard Forms for Estimates Explained at Joint Meeting of Contractors and Estimators of Chicago.

An interesting case of pupils turning into teachers of their former instructors is working out in Chicago which, if generally extended to other large centers of electrical contracting activity, is bound to produce much good to this often maligned craft. Mention has been made in previous issues of the ELECTRICAL REVIEW, notably in the issues of July 27 and Aug. 17, 1918, of the organization and work of the Chicago Electrical Estimators' Association. The former issue contained the association's famous report on labor cost data presented at the July convention of the National Association of Electrical Contractors and Dealers held in Cleveland, Ohio. In the second issue the history and activities of the association were discussed, it being shown that the aim was to develop scientific methods of estimating electrical work. Since the Cleveland convention and the wide circulation of the labor data report, the Electrical Estimators' Association has been in correspondence with estimators and electrical contractors in other cities, it being recognized that much could be learned from the work done in Chicago. Representatives of the association were asked to address the recent state conventions of electrical contractors in Illinois and Missouri. The wholesome educational work of the association is rapidly being extended to other sections of the country.

It was fitting, therefore, that the association's work should be called to the intimate attention of the electrical contractors of Chicago, the birthplace and headquarters of the association. On the evening of November 21 a meeting of the Chicago Association of Electrical Contractors and Dealers was held at the Athenean building, to which the officers and members of the Electrical Estimators' Association and a few special guests were invited. Addresses were first made by R. W. Poelma and A. McWilliams, presidents, respectively, of the two associations. The principal address was made by Albert Uhl, who explained in considerable detail the various steps in making a scientific estimate and then described the standard forms of estimate sheets now being published by the Electrical Estimators' Association. Further explanatory remarks were made by John R. Smith, secretary of this association.

Mr. Uhl discussed the importance of an accurate estimate and showed how the success of any contracting firm depends on elimination of guesswork in this line. The prevalence of the latter and trusting to luck, like a gambler, was the foundation of many of the evils of the contractor's business. If the architects, engineers, builders and business community in general are to raise their opinion of the electrical contracting fraternity, scientific methods of doing business will have to be employed. An intelligent, careful study of the plans and specifications is first necessary to find out just what is to be done and how it is expected to be done.

Standard forms for estimates have been prepared by the Electrical Estimators' Association, based on the experiences of many years and the requirements of jobs of all kinds. Seven kinds of sheets comprise the set as drawn up; slight revisions are being made in some of them. The first is the title sheet of the estimate and gives the principal facts as to the building or job, architect, owner, addresses of each, time limit of bid; it also has blanks for a record of the exact plans and drawings and specifications received, number of sheets of each, interlineations, corrections, inserts, etc.; the type and general dimensions of the building are summarized in a few blank squares, and a detailed and very useful index of the specifications is inciuded. Mr. Uhl showed how important it is to have a record for convenient reference of all these facts.

The next sheet is the lighting schedule, which has a large number of columns giving the elevations, location and type of ceiling, bracket, receptacle and switch outlets, total wattage, circuit conduit and wire. A feeder schedule gives the kind of feeder, from and to where it runs, its load, wire size, number of wires, one-way distance, conduit numbers and size. A low-tension schedule is provided for any bell, buzzer, telephone or other signaling circuits, fire or burglar alarms, etc. Another sheet gives a summary of the conduit and wire. A set of pricing sheets gives the kind of material, quantity, unit price, extension or gross price; likewise the labor unit price for installing this material and extension. For the labor unit, Mr. Uhl recommended the data on labor costs in the report on this subject prepared by the Estimators' Association (see ELECTRICAL REVIEW of July 27, 1918). This report was prepared from actual experience covering hundreds of jobs of various kinds and is acknowledged as the most reliable collection of such data yet prepared. Use of it eliminates one of the greatest sources of guesswork. Several pricing sheets may be needed on a large job.

The final sheet is the summary or recapitulation. This is an amplification of the summary sheet given at the top of page 129 of the issue referred to in the last paragraph and gives at a glance all the data needed to check the estimate as to material and labor and the principal details of each. Blanks are included for incidentals, nonproductive labor, overhead and profit, and the final totals.

In closing, Mr. Uhl again emphasized the importance of a scientific estimate and showed how a standard set of forms would help by eliminating the likelihood of forgetting important items and by making the estimate in general follow a definite procedure that has been found by long experience to lead to the most accurate and reliable results.

Mr. Smith was called on to explain some features of the labor cost data and of the method of checking the estimate by a fairly simple mathematical formula. He also described how distances could be quickly measured off the plans by a handy little instrument. Mr. Smith, who is secretary of the Electrical Estimators' Association of Chicago, told of the interest in scientific estimating being shown in other cities and how copies of the standard forms can be secured from him. His address is: care of Freeman-Sweet Co., 608 South Dearborn street, Chicago.

PLANS TO PROMOTE OUTLET BUSINESS STANDARDIZED.

Simplified Estimate and Proposal Form Expected to Stimulate Soliciting of Convenience Service Outlets.

In an attempt to standardize and promote the convenience service outlet business among contractors, the Society for Electrical Development, Inc., 29 West

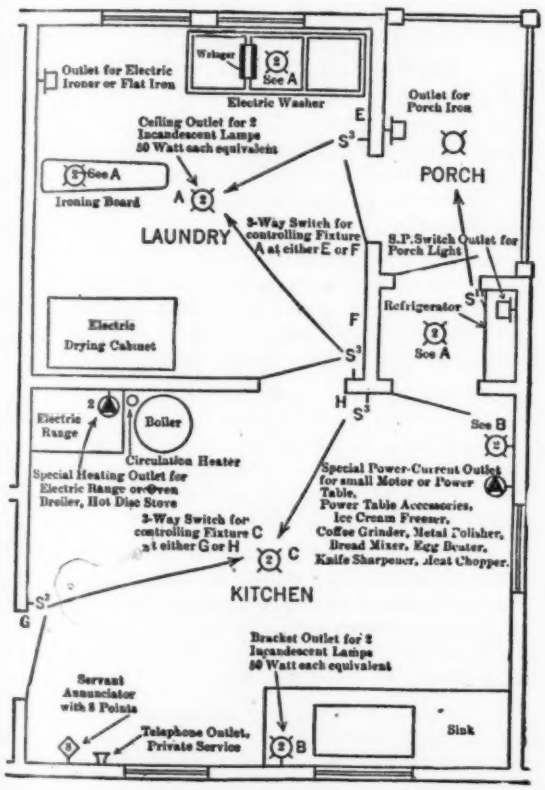

Outlet for Electric Ironer or Flat Iron
Wringer
See A
Electric Washer
Outlet for Porch Iron
Ceiling Outlet for 2 Incandescent Lamps 50 Watt each equivalent
PORCH
See A
Ironing Board
LAUNDRY
3-Way Switch for controlling Fixture A at either E or F
S.P. Switch Outlet for Porch Light
Refrigerator
See A
Electric Drying Cabinet
Electric Range
Boiler
Circulation Heater
See B
Special Heating Outlet for Electric Range or Oven Broiler, Hot Disc Stove
Special Power-Current Outlet for small Motor or Power Table, Power Table Accessories, Ice Cream Freezer, Coffee Grinder, Metal Polisher, Bread Mixer, Egg Beater, Knife Sharpener, Meat Chopper.
3-Way Switch for controlling Fixture C at either G or H
KITCHEN
Bracket Outlet for 2 Incandescent Lamps 50 Watt each equivalent
Servant Annunciator with 8 Points
Telephone Outlet, Private Service
Sink

Fig. 1. Location of Convenience Outlets in Kitchen and Laundry.

39th street, New York, has designed and printed a simplified estimate and proposal plan. The adoption of this plan assures the smallest contractor that his business-getting operations are conducted as efficiently as any larger contractor. The plan consists of three separate forms or sheets, each of which is very simple to understand but should prove very effective for the uses for which they are designed.

One of these sheets is a promotion form. On one side of this paper is a typical floor plan showing the various places where service outlets can be installed advantageously, and the uses to which they can be put. Portions of this sheet are reproduced herewith. In addition to the rooms shown this form also shows a living-room, a bedroom and a pantry and bathroom. The reverse side of this sheet contains brief but convincing arguments in favor of outlets and a list of appliances which can be attached to them.

Special pains were taken to simplify the proposal blank so that it might be easily understood by any prospective customer. All the facts regarding the work to be done are presented plainly without any

To Pantry
3-Way Switch Outlet for lighting Fixture B in Pantry
3-Way Switch Outlet for lighting Fixture A
See B
Bracket Outlet for 2 Incandescent Lamps 50 Watt each equivalent
Special Floor Outlet for Electric Cooking Toaster, Egg Boiler, Chafing Dish, Percolator
Serving
Table Bell Push to Kitchen Annunciator
Outlet for Elec. Serving Tray, Drink Mixer
Ceiling Outlet for 4 Incandescent Lamps 50 Watt each equivalent
Table
DINING ROOM
Special Outlet for Heater, Fan, Vacuum Cleaner, etc.
See B
3-Way Switch Outlet for lighting Fixture A
Push to Annunciator in Kitchen

Fig. 2.—Possible Location and Uses of Outlets in Dining Room.

legal phrases to confuse either the contractor or the customer. It is further simplified in that it becomes a formal contract without any other necessity than the customer's signature.

The standardized estimate blank is for use as the contractor's record and is entirely in keeping with the best record-keeping requirements.

These forms have been made up in lots sufficient for securing 30 jobs. Each lot contains 60 proposals, 20 estimate sheets and 10 floor plans. They can be secured at a very reasonable price from the Society.

PROTECTING SURFACE AROUND CEILING AND BRACKET OUTLETS.

By J. A. Wever.

In wiring finished buildings, especially residences, the house owner judges the installation mainly by the

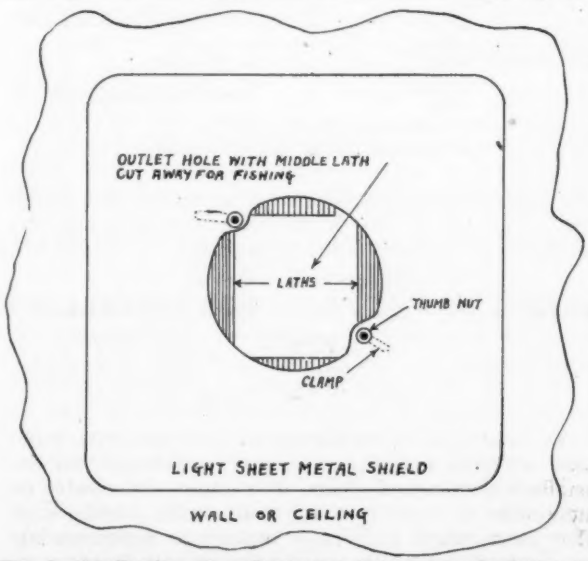


Fig. 1.—Application of a Protective Shield Around Outlet in Wall or Ceiling.

neatness with which the work is done, and it always pays to use every care to preserve the appearance of things. The shield herein described is intended to be placed over the outlet hole (see Fig. 1) after same has been cut in the plaster for the purpose of protecting the paper or finish of the ceiling or wall immediately surrounding the outlet from dirt and damage while fishing in the wires. It is made from very light sheet metal, about 12 in. square with a hole in the center, depending on the size of the outlet box used. It is

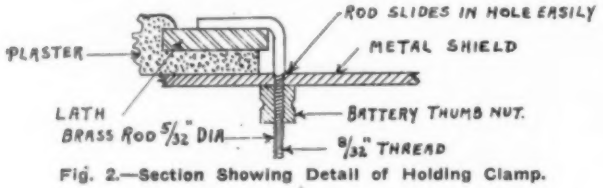


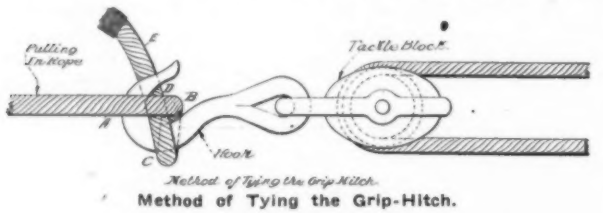
Fig. 2.—Section Showing Detail of Holding Clamp.

supported by means of two clamps and thumb nuts, as shown in detail in Fig. 2. This shield is cheap and easily made, and it takes but a minute to attach and detach. Several of them should be supplied so that they may be left at the various outlets until all the wires are run in and the boxes are ready to be set in place. The scheme can also be applied to switch outlets. For this purpose shields with proper sized holes to accommodate one, two and three-gang boxes should be provided.

HOW TO TIE A GRIP-HITCH.

By L. A. Latour.

When drawing on a pulling-in line with a set of tackle blocks it is often necessary, as the pulling proceeds, to catch the pulling line with the hook of the tackle block at various locations along its length. This may be readily and quickly effected by forming the hitch shown in the accompanying sketch in the tackle-block hook. To make this hitch, the pulling-in rope is passed through the hook at *B*, under it at *C*, and the free end *E* is passed through the loop at *D*. When a stress is imposed on *A* the loop *B* grips against *D*.



Method of Tying the Grip-Hitch.

Obviously, the greater the stress the tighter will be the grip. The use of this hitch renders unnecessary the use of knots or permanent fastenings.

BORING NEWEL POSTS FOR INSTALLING LIGHTS.

By J. T. St. Clair.

In most cases when boring solid newel posts, especially when of walnut, oak or other hardwood, for the installation of newel lights, it is either undesirable or impossible to bore two 11/16-in. holes beside each other or a single hole large enough to accommodate two loomed wires. It will be found to advantage to bore a single 11/16-in. hole through the post, as this usually furnishes sufficient exercise in itself, and then fish in a single loom containing two No. 14 fixture wires whenever permission to do this is granted by the inspector, or else use a piece of BX cable. In boring a newel it should be done from below, wherever possible, so that the bit clears itself as the secret of easy deep boring is in keeping the hole free of chips. When it is necessary to work from above it is advisable to use a bit welded to the extension on account of the danger of the chuck of the usual extension loosening and losing the bit during the frequent removals of same which are necessary to clean out the chips as the boring progresses. After each removal of the bit all the chips that remain at the bottom of the hole must be taken out so the worm can take hold again in the end grain without difficulty. This can be done nicely by a piece of moist soap at the end of a stick to which the chips readily adhere, and if accidently lost this will not cause any serious trouble.

AMONG THE CONTRACTORS.

Fire recently damaged the plant of the Lord Electric Co., located at 333 West 49th street, New York City. Considerable stock and machinery was destroyed.

The Electro Construction Co., Commercial Trust building, Philadelphia, Pa., has been awarded the contract for electrical work in connection with the new engine house to be erected at Perryville, Md., at a cost of $60,000.

The Globe Lighting Fixture Co., East Ninth street, Brooklyn, N. Y., has been awarded a contract for electric wiring, etc., in connection with the large, new seven-story apartment house being erected at Dwight street and Bergen avenue, Jersey City, N. J.

Contract has been awarded to J. T. Boland, 589 Lexington avenue, Long Island City, N. Y., for electric wiring, etc., in connection with the new factory building now in course of construction by the Hacich Asbestos Manufacturing Co. at Flushing, Long Island, estimated to cost $60,000.

In connection with the construction of a new addition and improvements to the box and packing plant of the Government at the Frankford Arsenal, to cost about $130,000, contract for electrical work has been awarded to the United Electric Construction Co., 1727 Sansom street, Philadelphia, Pa.

The United States Government recently awarded a contract to T. H. McKinney, Inc., Atlanta, Ga., for electrical work at the military camp at Fort Benning, Ga., including the construction of a new pole line from the city, about 8 miles. The cost of the entire work was estimated to be close to $1,000,000.

Russell & Co., 56 West 45th street, New York City, have been awarded contracts covering the complete electrical installation, including wiring, fixtures, fans, lamps and bells, for the new Y. W. C. A. hostess houses to be built at Camp Wadsworth, N. C., and Camp Raritan, N. J. The wiring in these buildings will be installed, using BX cable throughout. In addition this firm was recently awarded a contract for conduit wiring and fixtures for a warehouse at 40th street and Tenth avenue, New York City, and the installing of an underground system on a large estate at Rye, N. Y. This firm is also doing a considerable amount of house wiring, two large residences, one on 59th street and another on 53rd street, New York City, being among recently signed contracts.

New Appliances

Decorated Bowl—Horn-Gap Switch—Large Pipe Bender —Simple Fuse Plug—Portable Planer—Bench Grinder

A NEW ORNAMENTAL BOWL FOR DENZAR LIGHTING UNITS.

A bowl that lends to the greater beauty of its lighting unit—Denzar—has been developed by the Beardslee Chandelier Manufacturing Co., Chicago, Ill. The Denzar unit was described in our issue of March 4, 1916.

This bowl is made of opal glass. The conventional border around the upper portion is hand-colored in red and green, the colors being baked to give absolute permanency. The ornamentation does not cause shadows or interfere with the quality of light.

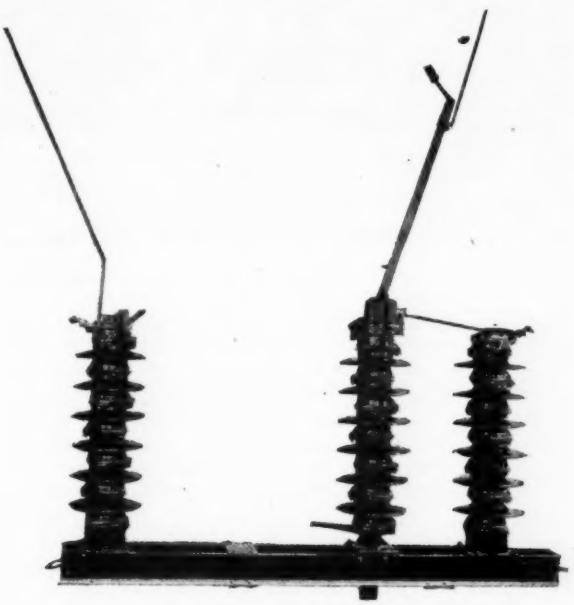
This new bowl, for use with the Denzar unit, is particularly adaptable for use in churches, club rooms, public buildings and other places where beauty and harmony are desired.

Denzar Unit Equipped With New Ornamental Bowl.

NEW VERTICAL-BREAK HORN-GAP SWITCH.

The accompanying cut pictures a new design of horn-gap switch of the vertical-break type. Operation is accomplished by rotating the center insulator. On top of this insulator is mounted a circular rack gear which meshes with a segment gear to which the switch arm is attached, so that a rotary motion of the insulator raises and lowers the switch arm.

There is no danger of the switch becoming inoperative due to sleet or winter storms. Every point where freezing may occur is guarded. The main contact is of the laminated-leaf-brush type, covered by a sleet hood of the same general construction as used in the Burke horn-gap switch. Its operation is positive under all weather conditions.



New Type Horn-Gap Switch with Vertical Break.

The main contact is protected from all burning by auxiliary arcing horns which make contact before, and break after the main contact.

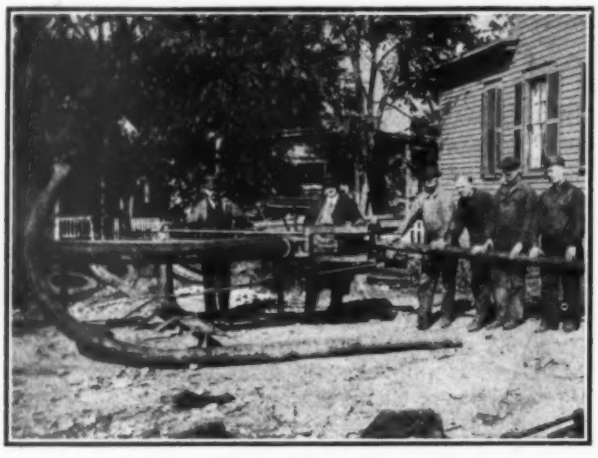
The insulators are of a sectional-unit type bolted together so that a damaged unit can be easily replaced. These switches are built for all voltages up to 150,000 volts. They are manufactured by the Railway & Industrial Engineering Co., of Pittsburgh, Pa.

HERCULES PIPE BENDER MAKES RECORD ON LARGE PIPE.

In power-plant construction it is very important for efficient and reliable service to have bends in steam, hot and cold water, and air piping made smoothly, without kinking the pipe, and usually with as large a radius as possible in order not to obstruct the flow of the fluid being conducted in the pipe. This applies especially to large pipe, say, 4 in. diameter and upward. To fit the bend to the exact conditions prevailing and at the same time to avoid more joints than are absolutely necessary, it is often desirable to bend the pipe on the job instead of using elbows.

Large pipe is usually bent hot and this makes it

very difficult to handle on the job; cold-bending, on the other hand, usually requires an enormous amount of power, which again makes it difficult to handle on the job. This latter difficulty has been overcome in the new Hercules pipe-bending machine made by the American Pipe Bending Machine Co., 37 Pearl street,



Hercules Pipe Bender Making Record Bends in 6-Inch Pipe.

Boston, Mass. This machine belongs to the company's "Wonder" type of pipe, tube and bar-bending machines and is unique in the extraordinary pressure that can be smoothly applied to pipes of even 6 in. diameter or still larger. The mechanical principle of the machine has been ingeniously worked out to apply this big pressure with few men and very quickly.

The illustration herewith shows 6-in. iron pipe being bent at Lowell, Mass. A 90° cold bend was made by the new Hercules bender in 9½ minutes and with 6 laborers handling the lever of the machine. These bends were as perfect as could be made by any other process, either hot or cold, and were made in this extraordinary record time at a labor cost of not over $1.50. The average charges for making a 6-in., 90° bend by pipe-bending concerns are $25 or more, and several hours are required to do the work.

PORTABLE MOTOR-OPERATED BENCH PLANER.

J. D. Wallace & Co., of Chicago, have developed a portable motor-operated bench planer or jointer for light woodwork operation. The device and motor are a single unit with direct drive through a flexible coupling. This delivers approximately 100% of the power to the cutter head, thus rating this sturdy little machine as having more power per inch of knife than the 2 to 5-hp. big jointers.

The saving effected by the Wallace bench planer is very great. It eliminates practically all of hand planing and saves many time-consuming trips to the big stationary jointer, for the Wallace bench planer is portable and can be taken to the work anywhere in the shop or on work outside.

An interesting mechanical feature of this machine is that three knives are operated in an alternating-current equipment, while two knives are used on a direct-current equipment. This is due to the fact that 4000 r.p.m. is required to do planing satisfactorily, while only 3600 r.p.m. can be had in an alternating-current motor.

Fractional-horsepower motors made by the General Electric Company are used to drive these planers. They are standard equipment and can be furnished for operation on any commercial circuit.

NEW BENCH-TYPE GRINDER AND BUFFER.

A new combination buffer and grinder has recently been added by the U. S. Electrical Manufacturing Co., Los Angeles, Cal., to their comprehensive line of electrical products. This machine is already being used extensively by many shipbuilding companies where its many qualifications have been quickly recognized. Production of this type has reached the point where they can now be sold at a very reasonable figure.

This latest type differs from the other styles of such equipment manufactured by this company, which were described in the ELECTRICAL REVIEW in the issue of June 16, 1917, in its pedestal only. These other styles had a pedestal about 3 ft. high, which permitted their use when set upon the floor. When this pedestal was not required, special arrangements had to be provided as the grinding wheels often fell below the level of the base of the motor.

The pedestal in this latest type is very short, yet heavy enough to form a substantial base for the grinder. The distance from the base of the pedestal being only 14 in., the machine can easily be used when mounted upon a bench. It is made in a variety of sizes and speeds up to 3 hp. and contains the same equipment that is included in the other types made by this company.

SIMPLE RENEWABLE FUSE PLUG.

A fuse plug of extremely simple design has been developed by A. F. Daum, 1157 Hodgkiss street, Pittsburgh, Pa. It is of the Edison type and has been reduced to the fewest possible elements. It consists of only three parts: A one-piece porcelain body with outside thread to fit the cutout, a fuse strip, and a mica disk cover. The fuse strip can be inserted in a few moments. It is pushed through a slot alongside the

View Showing Construction of Daum Renewable Fuse Plug.

middle of the bottom, pulled up inside and bent through a slot near the top and over to the outside, being fastened in a little pocket at the bottom of the thread; the other end is bent over the bottom button, thus forming the end contact, then pushed through another slot on the opposite side of the button, and bent over inside to prevent the end falling out when the fuse blows. After the mica is replaced, the plug can be put back ready for use. These plugs are made in 3 to 30-ampere sizes for 125 volts, and are especially suited for markets, such as in certain foreign countries, where the lowest possible cost must be met.

Trade Activities

Johns-Manville to Build Large Factory—Daum Refillable Fuses to be Produced in Far East—Special Literature

Ohio Brass Co., Mansfield, Ohio, announces the removal of its New York office from 30 Church street to 1781 Hudson Terminal building, 50 Church street.

W. H. Seldon, Jr., president of the **Elliott Electric Co.,** Cleveland, Ohio, announces the removal of his firm from 322-326 Champlain avenue to 813-815 Superior avenue, N. W. The Elliott company occupies the entire five floors and basement of its new quarters, which is more desirable because of its more central location.

Power Specialty Co., 111 Broadway, New York City, manufacturer of Foster superheaters and other power plant specialties, has commenced the construction of new additions to its plant at Danville, N. Y., to increase its present capacity. The company is now giving employment to about 325 persons at the works, and it is understood that additional labor will be employed following the completion of the new extensions.

Dwight P. Robinson & Co., Inc., has opened offices at 61 Broadway, New York City, and will be an important and influential addition to construction and engineering organizations in this country. Mr. Robinson for 25 years past has been associated in a leading capacity with Stone & Webster. Associated with him will be other Stone & Webster men of experience, including Roy M. Henderson, in charge of construction, and C. W. Clarke, M. E. Thomas, D. L. Galusha and R. A. Phillips, all of whom have been occupied with war work and, now that the need of such work is past, have become part of this organization with abundant financial resources to handle big work.

A. F. Daum, 1157 Hodgkiss street, Pittsburgh, Pa., manufacturer of Daum refillable fuses, has arranged to have his fuses produced in the Far East, particularly Japan and China. He has granted the sole license under the Daum patents for these countries to the Tyo Denke Kogy Kaisha (which means the Oriental Electric Industrial Corporation) of Nagoga, Japan. Shigekata Mori, chief engineer of this corporation, was recently at the Daum plant arranging the details. Mr. Mori stated that heretofore all fuses have been imported into these countries and that his company will be the first to manufacture renewable fuses in the Far East.

Champion & Ryan have opened an office at 299 Broadway, New York City, and will act as manufacturer's representative, both for local and export trade, intending eventually to devote most of its activities in the export field. The firm's local territory will embrace Boston, New York and Philadelphia, and their lines for export comprise automobile shoes and tires, nitrogen and tungsten lamps, time switches, etc. They are prepared to handle locally, heating and cooking appliances, fans, motors, etc. Mr. Champion was formerly manager of the engineering division of H. Boker & Co., New York City, and Mr. Ryan was associated with him as assistant. Previous to this, Mr. Champion was president of the Kandem Electric Co., Inc., New York City, which was absorbed by the Menominee Electric Manufacturing Company.

H. W. Johns-Manville Co., New York, one of the largest manufacturers of asbestos and magnesia products, recently purchased from different owners a tract of approximately 255 acres, north and adjoining Waukegan, Ill., lying between the Chicago & Northwestern tracks and Lake Michigan, which will be connected with the Elgin, Joliet & Eastern and Northwestern railroads. It is stated the purchase is for immediate improvement, not only to meet present demands, but will also include after-the-war requirements, as covered under the reconstruction period. It is the intention of the company to erect as soon as conditions permit a duplicate of its large plant at Manville, N. J. It will cover 1,250,000 sq. ft. of floor space, at a cost of approximately $3,000,000, and will give employment to 2,500 to 5,000 persons. The output of the plant is expected to be upwards of 35,000 carloads a year.

Standard Electric Co., Inc., is the new firm name of Petersen Brothers, Cedar Rapids, Iowa. The company, which formerly conducted an electrical construction business, has discontinued this work to take up the manufacture of lighting fixtures. The company has recently placed a new fixture-bowl hanger on the market.

New Process Gear Corporation, Syracuse, N. Y., has been purchased outright by John N. Willys, president of Willys-Overland, Inc., who has taken over all of the entire capital stock of the concern. Thomas W. Meachem and other members of the Meachem family connected with the corporation have retired, having sold all their interests to Mr. Willys. No change of active management has been intimated.

Benjamin Electric Manufacturing Co., 806 West Washington boulevard, Chicago, has issued a number of perforated sheets for insertion in the catalog dealing with marine lighting and signaling apparatus, recently issued by the company. These pages illustrate and describe new water-tight push and pull switches, water-tight reflector fixtures, outlet boxes and receptacles and receptacle-switches.

Main Electric Manufacturing Co., Inc., manufacturer of electric lighting and power plants, Pittsburgh, Pa., has published the fourth edition of its Bulletin 105, descriptive of Main battery charging equipment for the public garage. These charging equipments are designed to meet the requirements of the small, isolated garage at the country cross-roads where electricity is not available as they generate their own power, usually being driven from a gas engine in such instances. The larger sets described are for the more complete city garage, requiring both battery charging and lighting. This line of battery charging equipment has been on the market about three years and has given great satisfaction, not only in the United States but in many foreign countries as well.

Westinghouse Iron a Friend of Uncle Sam's Men.—In the cantonments, on shipboard and with General Pershing, "over there," the boys in the service are finding out the real worth of the menial labor-saving appliances that heretofore they had not recognized as essentials. Among the many appliances and devices that the soldiers and sailors have tried out, the electric iron, without a doubt, is the nearest to their hearts, and in this connection the Westinghouse iron has become increasingly popular. To the great majority of these khaki and blue-clad lads, the pressing of their own clothes is a new experience, and yet in order to have clothes that are well-pressed and a credit to the wearer, they are compelled to spend many hours each month in pressing their uniforms. In many instances, a dozen or more chaps have "chipped" together and have bought an electric iron.

Western Electric Co., New York, has just issued its 1919 year book of electrical supplies, containing 1120 pages, and has not permitted present abnormal conditions to interfere with its practice of preparing annually a year book for the benefit of its customers. While the coming year is certain to be a period of fluctuating values, the uniform list price and discount plan of the Western Electric Co. provides a very complete electrical guide for estimating, cost requisitions, and for retail counter use. The book follows the customary plan of showing list prices which, with a few exceptions, permit a uniform discount, and in addition, contains the manufacturers' list prices on standard supplies, for the convenience of customers who prefer to purchase on that basis. The 1919 year book is more complete than previous editions, and in addition to the listing of electrical supplies and equipment it contains 24 pages of tables and useful information. Supplementing this book, the company will furnish upon request, descriptive matter of all items of electrical equipment dealt in by the electrical trade.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

LEESVILLE, Conn.—Central Connecticut Power Co. has made application to the federal authorities for permission to construct its proposed power house addition to its plant. The structure will be one-story, and is estimated to cost $26,000. Jenks & Ballow, 735 Grosvenor building, Providence, R. I., are engineers for the company.

BUFFALO, N. Y.—Clemens Electrical Corporation, 725 Main street, has filed notice of an increase in its capitalization from $10,000 to $100,000 to provide for expansion.

BUFFALO, N. Y.—Empire Engineering Co., Marine Bank building, has submitted a low price for the construction of the new Tonawanda and North Tonawanda intake pipe lines in the Niagara river adjoining these communities, and is understood to be arranging for final contract signatures with officials of the respective municipalities. This work will be used in conjunction with the government project to deepen the channel of the river.

BUFFALO, N. Y.—A total of $5,000 has been donated to the United War Work fund by the Buffalo General Electric Co.

BUFFALO, N. Y.—The council will replace the gas lights in many streets with electric lights. Address John F. Cochrane, city comptroller, 300 Ellicott Square.

MONTAUK, N. Y.—The United States Government, Navy Department, has taken bids for a new extension to the heating system at the local government site.

NIAGARA FALLS, N. Y.—All contracts have been awarded by the Republic Carbon Co. for the erection of its proposed plant on Sugar street, to comprise four factory buildings, three one-story, about 90x144 feet, 80x340 feet, and 48x100 feet, and one four-story, 32x80 feet in dimensions.

SYRACUSE, N. Y.—A commission of which Giles H. Stilwell is the chairman, appointed by Mayor Stone, has reported that Syracuse would be best served by a municipal lighting plant, and has recommended by the question of purchasing the present Syracuse Lighting Co. be submitted to a vote of the people for decision.

BLOOMFIELD, N. J.—International Arms & Fuse Co., Inc., Grove street, has completed arrangements for the construction of a new one-story brick addition to its power house, about 38x40 feet in size, to cost $7,500.

EAST ORANGE, N. J.—East Orange Storage Battery Co. has filed notice of authorization to operate at 372 Central avenue. M. Devere, 239 South Clinton street, heads the company.

GARWOOD, N. J.—National Boiler Co., South avenue, is having revised plans prepared for the construction of a one-story foundry addition to its plant, brick and reinforced concrete, about 100x105 feet. Hooper & Co., 116 Market street, Newark, are engineers for the company.

IRVINGTON, N. J.—Electric Shop, Inc., has filed notice of authorization to operate a repair shop at 1051 Springfield avenue. Frederick W. Baab, 131 Maple avenue, heads the company.

LAMBERTVILLE, N. J.—Lambertville Public Service Co. has made application to the Board of Public Utility Commissioners for permission to increase its rates for lighting and power service by adding a surcharge of 25 per cent on all monthly bills.

MORRISTOWN, N. J.—Central New Jersey Power Co., recently incorporated with a capital of $125,000, has commenced the construction of a dam across the Black river, near Chester, the site of the proposed hydroelectric plant.

TRENTON, N. J.—The city commission is considering plans for the immediate installation of new pumping equipment at the local waterworks plant, to provide for increased capacity. The new pumps will be electrically operated.

WRIGHTSTOWN, N. J.—Fire recently destroyed the boiler plant at the local military camp, caused by an explosion. It is understood that the building will be reconstructed at once.

BETHLEHEM, PA. — Bethlehem Steel Co. has awarded a contract to the Pomeroy Construction Co., Philadelphia, for the construction of a pump house at its plant.

CARLISLE, PA.—Carlisle Light, Heat & Power Co. has filed notice with the Public Service Commission of an increase in its rates for service.

FORT MIFFLIN, PA.—The United States Government, Navy Department, has awarded a contract to Wark & Co., 1737 Filbert street, for the erection of a new pumping plant (Specification 3842) at the local sttion, to cost about $4598.

HARRISBURG, PA. — Harrisburg Light & Power Co. has completed the establishment of a new steam substation at Third and Reilly streets, to furnish service for heating purposes. C. M. Kaltwasser is manager of the company.

HARRISBURG, PA.—To aid in the conservation of fuel, the city is planning for the installation of new boiler equipment, including grates, blowers, etc., at the city filtration plant.

LUCINDA, PA.—Ground has been broken by the Lucinda Coal Co. for the construction of a power house at its local properties, to be used for works operation. The structure will cost $8000.

NANTICOKE, PA.—Liberty Throwing Co. has had plans prepared for the construction of a one-story boiler plant at its local works, about 32x50 feet. The structure is estimated to cost $8000.

NORTH EAST, PA.—Electric Materials Co. is making rapid progress in the construction of a one-story addition to its plant, about 40x60 feet, to cost $35,000.

PHILADELPHIA, PA.—The United States Government has awarded a contract to the Turner Concrete Steel Co., 1713 Sansom street, for the construction of a motor generator and air compressor building to be known as Building No. 45.

PHILADELPHIA, PA. — Philadelphia Electric Co. is completing the erection of its new building at Tenth and Chestnut streets. A large force of men is working both on the interior and exterior of the new structure, which will be one of the most handsome in this section.

PHILADELPHIA, PA.—Welsbach Street Lighting Co. of America submitted the only bid to the Department of Public Works for the furnishing and maintenance of lamps throughout the city for 1919 at $47.80 per lamp. There are 10,000 of these lamps in the suburban sections and the city proper, making the total bid $478,000.

PITTSBURGH, PA.—Announcement has been made by the West Penn Power Co. that the issue of two-year 6% collateral gold notes, dated Aug. 1, 1917, has been called for redemption on January 7, 1919, at the office of the Equitable Trust Co., 37 Wall street, New York, at 100½ with interest accrued to the date of redemption. A M. Lynn is president.

PITTSBURGH, PA.—James B. Clark has had plans prepared for the erection of a boiler plant and stack at 4109 Butler street. A building permit for the structure has been issued.

SCRANTON, PA.—Delaware, Lackawanna & Western Railroad Co. has taken bids for the erection of a one-story addition to the boiler plant at its properties at Nanticoke. The new addition will be about 51x80 feet, and in connection with the remodeling of the existing structure, will cost approximately $40,000.

CURTIS BAY, MD.—The Emergency Fleet Corporation has awarded a contract to the McAleer Construction Co., 15 East Fayette street, Baltimore, for the construction of a one-story transformer house at the plant of the Baltimore Car & Foundry Co., estimated to cost $8000.

SPARROWS POINT, MD.—Bethlehem Shipbuilding Corporation, Ltd., has commenced the construction of a number of new shop additions at its local plant, including a new electrical shop.

BELLEVUE, D. C.—The Government, Navy Department, has awarded a contract to the George F. Pawling Co., South Penn square, Philadelphia, Pa., for the installation of a central heating plant at the local Government station, in connection with the construction of new additions, the entire work to cost $133,210. The department is also planning for the installation of new electric cranes to cost $30,000.

WASHINGTON, D. C.—In connection with the Naval Appropriation bill for 1919 recently presented to Congress, the sum of $115,000,000 has been requisitioned for new ship batteries, $5,150,000 for the construction of a new dry dock at the Philadelphia, Pa., navy yards, including the erection of a power plant and shop buildings, and $2,525,000 has been asked for the construction of a new waterworks system at the Key West (Fla.) naval station, including pumping plants, equipment, etc.

MOORFIELD, W. VA.—The city has approved a bond issue for $8000 to provide for the installation of a new electric light system.

TIOGA, W. VA.—Tioga Coal Co. is in market for electrical coal mining machinery. J. N. Berthy, Jr., manager.

ELLOREE, S. C.—Elloree Electric Light Co. is planning for the reconstruction of its plant recently destroyed by fire. D. T. Evans is president.

FREMONT, N. C.—The city has approved a bond issue for $25,000 to be used for improvements in the electric lighting system. L. H. Mumford is city clerk.

ROME, GA.—The city may install equipment in waterworks pumping station to generate electricity for power and lighting. Address mayor.

SUMMERVILLE, GA.—City Light & Power Co., recently organized, is planning for the construction of a local electric light system.

NORTH CENTRAL STATES.

CLEVELAND, OHIO.—The city will erect a $300,000 power plant at East 53rd street, which will provide 10,000 kw. additional power. A bond issue to finance this project has been approved by the Capital Issues Commission.

LIMA, OHIO.—A movement is again started for building a municipal lighting plant. Address city clerk.

MASSILLON, OHIO.—The Massillon Electric & Gas Co. has been given a permit for the rebuilding of the plant which was destroyed by an explosion last spring. The cost will be $30,000.

NEW LEXINGTON, OHIO.—Perry County Telephone Co. has increased its capital from $75,000 to $125,000. Extensive improvements will be made.

ST. MARYS, OHIO.—At a meeting of the Board of Control, the contract for the excavation and concrete work for the new electric light plant was awarded to the Joseph Skeldon Engineer Co., of Toledo, at its bid of $7945. The contract for piping, wiring and installing the units will be let when the $20,000 bond issue has been awarded. This will possibly take till the first of the year.

DATES AHEAD.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 3-6. Secretary, Calvin W. Rice, 29 W. 39th street, New York, N. Y.

Electrical Supply Jobbers' Association. Semi-annual meeting, Cleveland, Ohio, Dec. 9, 10 and 11. General secretary. Franklin Overbagh, 411 S. Clinton street, Chicago.

Florida Engineering Society. Annual meeting, Jacksonville, Jan. 5, 1919. Secretary, J. R. Benton, Gainesville, Fla.

American Institute of Consulting Engineers, Inc. Annual meeting, New York City, Jan. 13, 1919. Deputy secretary, B. Etchelle, 35 Nassau street, New York City.

Northern White Cedar Association. Annual meeting, Milwaukee, Wis., Jan. 21, 1919. Secretary, N. E. Boucher, 702 Lumber Exchange, Minneapolis, Minn.

Western Association of Electrical Inspectors. Annual meeting, Chicago, Ill., Jan. 28-30, 1919. Secretary, W. S. Boyd, 175 West Jackson boulevard, Chicago, Ill.

Oklahoma Utilities Association. Annual meeting, Oklahoma City, Okla., Feb. 13, 14 and 15. Secretary, H. A. Lane, Oklahoma City, Okla.

New Mexico Electrical Association. Annual meeting, Albuquerque, N. Mex., Feb. 17-19. Secretary-treasurer, Charles E. Twogood, Albuquerque, N. Mex.

GARY, IND.—Erection of a new pant in Gary to cost $25,000,000 has been decided upon by the National Tube Co., which is a subsidiary of the United States Steel Corporation. Four new blast furnaces will be erected by the United States Steel Corporation to cost about $5,000,000. The American Car & Foundry Co. is said to be planning on carrying out its pre-war construction, that of a new $10,000,000 plant, with the opening of spring.

NORTH MANCHESTER, IND.—Brown Mills Electric Co. has increased its capital stock from $25,000 to $68,000.

SHOALS, IND.—Shoals Light & Power Co., which furnishes electricity to the Shoals Utilities Co. and operates the local electric light and water plants, is installing steam power engines, replacing oil burning engines.

TERRE HAUTE, IND.—Under the terms of its franchise, the Terre Haute, Indianapolis & Eastern Traction Co. has made its first payment to the city of $1000 for its franchise rights in Terre Haute. On Feb. 3, 1903, the traction company, which operates the local street car system, entered into an agreement with the Board of Public Works and the city council that for certain franchise rights the company would pay the city of Terre Haute an aggregate sum of $78,000. Of this amount $16,000 was paid in 1903 with the next payment of $1000 due Nov. 20, 1918. The company is bound to pay $1000 yearly for the next 19 years and $3000 a year for 14 years, beginning November 20, 1938.

CHAMPAIGN, ILL.—Caldwell Electric Co. has purchased the property in the north part of town known as the former piano factory, together with seven acres of land, and will use this location as a future site for their business. The company does not intend to remove at once to the new location but will use the building within the next year. The property was purchased from the Continental and Commercial Trust and Savings Bank of Chicago as trustee.

CHICAGO HEIGHTS, ILL.—Armour Fertilizer Works will erect a plant to cost approximately $500,000.

DIVERNON, ILL.—Fire of unknown origin recently destroyed the electric light plant at Divernon, causing the total loss of the building and its contents, valued at $50,000.

DURAND, ILL.—Citizens Utilities Co. has increased its capital from $5000 to $40,000.

PEORIA, ILL.—Illinois Traction system increased its fares to three cents a mile, effective November 15, between all points within the state of Illinois. A reduction of 10% will be made on all purchases of round-trip tickets. The fare will be computed on the basis as that charged by steam roads. Heretofore, the company has maintained a 2-cent fare for tickets and 2½-cent cash fare on all its lines.

SOUTH CHICAGO, ILL.—Among the after-the-war building plans for South Chicago are the following projects, some of which were planned when the United States entered the war: Wisconsin Steel Co., the steel making department of the International Harvester Co., to build a number of batteries of coke ovens to cost approximately $5,000,000, together with much auxiliary construction incident thereto; the Iroquois Iron Co., to construct new furnaces, mills and other buildings, the construction program to involve $10,000,000; the Illinois Steel Company has construction plans under consideration aggregating $5,000,000; the By-products Coke Corporation has purchased a large tract of land for expansion purposes; the breakwater pier built in Lake Calumet will call for heavy additional expenses by the south park commissioners; the South Chicago Savings Bank will erect a new bank and office building to cost $250,000; and extensive docks and wharves are planned for Lake Calumet.

EAU CLAIRE, WIS.—Wisconsin-Minnesota Light & Power Co. will probably build power dam at either Chippewa Falls, Holcombe or Dunnville. C. A. Coh, general superintendent, Eau Claire.

EVANSVILLE, WIS.—Porter Electric Line Co. proposes to supply electricity to farmers in the vicinity. Joseph E. Porter is interested.

GRAFTON, WIS.—Badger Rolling Mills contemplates to secure electric power. A. W. Roebben, manager.

LA CROSSE, WIS.—La Crosse Telephone Co. will build an addition to its exchange to cost $15,000.

MARSHFIELD, WIS.—Marshfield Farm Electric Co. has changed its name to the Marshfield Electric Co.

MILWAUKEE, WIS. — Milwaukee Electric Railway & Light Co. is considering the construction of electric power plant. James D. Mortimer, president.

KANSAS CITY, MO.—Kansas City Light & Power Co. will erect a substation at 12th street near Bristol avenue. It will be a one-story structure and will cost between $15,000 and $20,000. Address Sargent & Lundy, engineers, 72 Adams street, Chicago.

MARSHFIELD, MO. — The city voted on $15,000 municipal lighting plant bonds at a recent election. Address the mayor.

WESTON, MO.—Election to vote $20,000 bonds for the purpose of acquiring and maintaining an electric plant carried.

ELDORADO, KANS.—A fire in the warehouse at the Kansas Gas & Electric Co. resulted in the loss of a large number of motors, which will amount to about $150,000, according to a report received by L. O. Ripley, vice-president of the company here. Both building and contents are said to be a complete loss.

BURWELL, NEB.—$13,500 electric light bonds have been sold. Address city clerk.

MADISON, S. DAK.—Plans are being prepared for a $100,000 municipal light and water system. Address M. N. Rae, city auditor.

SIOUX FALLS, S. DAK.—$30,000 municipal light bonds have been authorized by fire. Address city clerk.

WESSINGTON SPRINGS, S. DAK. —$20,000 electric light bonds will be offered for sale at once. W. B. Wilson, city auditor.

SCRANTON, N. DAK.—The Johnson Fuel Co. is planning to install electric light plant. C. A. Johnson, Fairfax, S. Dak.

SOUTH CENTRAL STATES.

OWENSBORO, KY.—Kentucky Electrical Co. has filed notice of an increase in its capitalization from $50,000 to $105,000 to provide for expansion.

BAY ST. LOUIS, MISS.—Plans have been arranged by the cities of New Orleans and Mobile, Ala., for the holding of a conference at Bay St. Louis early in January, to prepare preliminary plans for the construction of a new electric interurban railway between the two municipalities. In connection with this work, hydroelectric plants will be established for the operation of the system.

TUTWILER, MISS.—The city is considering voting on bonds for construction of electric light plant. Address mayor.

COTTER, ARK.—The proposed new hydroelectric plant to be erected on the White river by the Dixie Power Co. is estimated to cost in the neighborhood of $5,000,000, and will develop approximately 60,000 hp. Included in the project is the construction of a dam across the river 2000 ft. long and 150 ft. high. Walker Powell is president.

MOORINGSPORT, LA.—Oil City Electric Light & Power Co., Oil City, La., will erect an addition to its plant to supply additional light and power to towns of Mooringsport and Oil City.

ADA, OKLA.—Ada Electric Light & Gas Co. has completed negotiations with the city officials of Seminole for the construction of transmission system to that locality, for the purpose of furnishing electric energy for light and power purposes.

CAMP McARTHUR, TEX.—Considerable new electrical equipment will be required in connection with the new local refrigerating plant to be erected at a cost of $50,000.

WESTERN STATES.

PETERSBURG, COLO.—The power house of the National Alfalfa Products Co. was recently destroyed by fire.

MOLSON, WASH.—Ward Brothers, owners of the Molson electric light plant, contemplate the purchase of an auxiliary generator, and also a gasoline engine, which will be used to relieve the steam outfit in the evening after the peak loads are off until the midnight hour.

PASCO, WASH.—The flour mill at this place is to be increased in capacity by an addition to the building and new equipment, including 150 hp. in motors for electric drive.

SEATTLE, WASH.—The substation of the Puget Sound Traction, Light & Power Co. was destroyed by fire recently, causing a loss of approximately $100,000. The station contained 10 large transformers with switchboards, dynamos and converters for distributing the current to different lines.

SPOKANE, WASH. — Washington Water Power Co. has under consideration the expenditure of $3,000,000 in the construction of a Niagara power plant which will place in service all the water of the Spokane river. It will have a capacity of 40,000 hp. to be utilized for manufacturing purposes.

SPOKANE, WASH. — Washington Water Power Co. will soon begin work on the installation of the new street lighting to be furnished the city. The new lamps, which are of the nitrogen-filled type, will replace the old carbon arcs, which have been in use for nearly 25 years. The new contract covers a period of 10 years and calls for 1410 lamps at $52,170 a year.

PORTLAND, ORE.—Globe Grain & Milling Co. has plans completed for a new flour mill which will require 200 hp. in electric motors.

PORTLAND, ORE.—W. R. Bagot & Co. is planning the construction of a new flour mill, requiring 200 hp. in motors. It has a site near the municipal grain elevators at St. Johns, Portland.

EL CENTRO, CAL.—Holton Power Co. is planning to spend between $50,000 and $100,000 in repairing the Holtville auxiliary plant in the near future.

HAPPY CAMP, CAL.—Mason Valley Mines Co. is considering plans for the construction of a new concentrating plant at its Gray Eagle copper mines, in Siskiyou county. Considerable electrical equipment will be required in this connection.

LOS ANGELES, CAL.—Pacific Electric Railway Co., Pacific Electric building, has had plans prepared for the construction of a one-story brick and concrete substation, about 35x50 feet, to be located at Seventh street and Maple avenue.

LOS ANGELES, CAL.—President Howard Robertson states that the way is now clear for the construction of municipal power plant No. 2 in the San Francisco Canyon, which plant will cost $1,400,000 and which will have a capacity output of 28,000 hp.

PALMDALE, CAL.—Palmdale Irrigation District has under consideration the installation of new electrically-operated pumping plants in the Antelope Valley section, to cost about $500,000.

SAN DIEGO, CAL.—Union Ice Co. has had plans prepared for the construction of an addition to its ice manufacturing plant to cost about $18,000. Considerable new electrical machinery and equipment will be required.

CANADA.

BOSTON CREEK, ONT.—Northern Ontario Light & Power Co. is said to be considering extensions in its system to supply electric energy to the Boston Creek mining district.

PRINCE RUPERT, B. C.—Prince Rupert Hydroelectric Co. is considering plans for the early construction of a hydroelectric plant. The structure is estimated to cost $100,000. P. Lorenzen is engineer.

PROPOSALS

INCANDESCENT LAMPS—Bids will be received by the Commissioner of Gas and Electricity, Room 614 City Hall, Chicago, Ill., Dec. 4, for furnishing and delivering to the city of Chicago, Department of Gas and Electricity, sundry kinds and sizes of incandescent lamps for use during the year 1919, strictly in accordance with specifications on file in the office of said official and for the approximate quantities as therein stated. Each bidder will be required to submit two of each kind or type of lamp upon which a proposal is submitted. Address William G. Keith, Commissioner of Gas and Electricity.

ELECTRIC TRAVELING CRANES.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 2, for electric traveling cranes for structural shops at Mare Island. The cost is estimated at $275,000. (Specification 3240.)

INCORPORATIONS

KINGFIELD, ME.—Stratton Light Company has been incorporated with a capital of $10,000, by Edwin H. Gross, Cremandel Blanchard, Forrest R. Wing, William A. Lee, Merla A. Bates, Frank H. McLean, Stratton.

NEW YORK, N. Y.—Charles F. Campbell, Inc., has incorporated, to operate a general electrical contracting establishment. Capital, $10,000. Incorporators: A. L. Hendrickson, C. F. Campbell and H. Herz, 224 West One Hundred and Twenty-second street.

Recent Patents

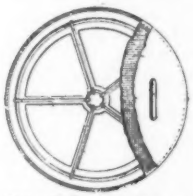
Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Door-Controlled Switch (1,281,219).—The switch designed by James F. Rippin (of Johnstown, Pa.) is geared to a star wheel which is rotated by an arm mounted on the door.

Safety Device for Sad Irons (1,281,045).—The handle of a flatiron is hinged and is swung somewhat upward when the handle is not pressed down, thus opening the circuit through a switch connected to the handle. Patented by Richard J. Marshall, of Brooklyn, N. Y.

Battery-Vault Construction (1,281,404 to 1,281,408).—A series of five patents to Charles H. Marquess, of Minneapolis, Minn., four of which relate to economical methods of building battery vaults (for housing signal batteries underground) partly by spraying cement on a core which is rotated on a horizontal platform. The third, from which our illustration is taken, shows a manhole cover with a frost-insulating material as a part of the same.



No. 1,281,406.—Construction of Battery-Vault Cover.

Recovering Battery Fluids (1,281,857).—Samuel H. Sheib (of Richmond, Va.) collects the alkaline electrolyte of primary batteries in a drum, waits till oils rise in it, then drains the fluid from the bottom of the drum into a tank and subjects it to an electric current to separate the zinc.

Battery Depolarizer (1,281,372).—For primary batteries, Major E. Holmes of Lakewood, Ohio (according to this patent, assigned to the National Carbon Co.) uses a depolarizer consisting either of molybdenum trioxide combined with a basic oxide, or of ammonium phosphomolybdate.

Work-Controlled Motors 1,281,439).—An ingenious arrangement whereby motor speeds are automatically adjusted according to the work performed by the individual motors is shown in this patent to Marie J. A. Vicaire (of Paris, France), assigned to the Bridgeport Brass Co. on an application filed in 1913. The patent relates more specifically to a multiple-wire-drawing machine and discloses an arrangement of successive wire-drawing means each so constructed that it will automatically decrease in speed with an increase in the tension of the wire.

Arc-Lamp Electrode (1,281,796).—Titanium oxide mixed with a compound of uranium comprises the electrode patented by Isador Ladoff of the Westinghouse Electric & Mfg. Co.

Ventilating Searchlights (1,281,754).—Arrangements for causing air currents to flow in certain effective directions through the casing of an arc searchlight are shown in this patent to Heinrich Beck, of Schenectady, N. Y.

Welding Metal Sheets (1,281,454).—Instead of welding overlapped sheets to each other in circular spots, Alexander P. White (of Caldwell, N. J.) presses the sheets between the ends of opposed tubular electrodes, so as to produce a ring-shaped weld. While doing so, he applies air blasts both inside one of the tubes and outside the latter.

Dry Battery (1,281,409).—To line a zinc can, Edward L. Marshall (of Fremont, Ohio) applies wet and uncooked flour paste to a dry lining, dries the paste and the lining, then inserts the lining in the zinc can and wets both the dried flour and the lining. A somewhat similar method, also assigned to the National Carbon Co., is described in Patent No. 1,281,421 to Lloyd R. Rhoades.

Motor Controllers (1,281,346 and 1,281,347).—Two patents to Maurice M. Goldenstein, of Milwaukee, both assigned to the Cutler-Hammer Mfg. Co. The first relates to installations where separately operable switches control independent line connections for the controllers associated with different motors. For such cases, the controllers can be coupled together for joint operation, but means are provided whereby the coupled controllers cannot be started unless each of the line switches is closed. The second patent relates to a speed-regulating controller which may be adjusted for any one of a number of motor speeds. In this connection, Mr. Goldenstein provides means for automatically rupturing the power connections of the motor in case the speed varies from the predetermined rate either positively or negatively to a given extent.

Electric Furnace Regulation (1,281,280).—Where the electrodes are moved by fluid pressure, Jene Orton Boving (of London, England) regulates this pressure by means of a valve controlled by an electromagnet in circuit with the furnace electrode.

Indicating Fuse (1,281,285).—An indictator device connected to a small spring which is controlled as to its position by an arm in the blowout zone of the fuse strips, is shown in this patent to Leonard B. Buchanan of Woburn, Mass.

Producing Scenic Effects (1,281,720).—To simulate fog or smoke, Richard W. Tully (of Sierra Madre, Cal.) illuminates a screen directly from the front of the stage, and indirectly from the rear through a translucent medium. Then he varies the illumination in sidewise shifting portions to produce an apparent wavy or traveling effect.

Joining Aluminum Conductors (1,281,517).—To connect conductors which cannot readily be soldered, such as aluminum cables, Lewis W. Chubb (of Edgewood Park, Pa.) welds the tip of each cable to a short conductor made of an easily solderable material and splices these short conductors to each other.

No. 1,281,517.—Splicing Aluminum Conductors.

Electrotherapeutic Apparatus (1,280,857).—For treating the arm or leg of a patient with both the light and heat rays of lamps, Vern L. Ruiter (of Myrtle Creek, Ore.) mounts the lamps in a split drum with a highly polished metallic inner wall, forming an effective reflector.

Making Molded Conductors (1,281,716).—Mercury is mixed with finely divided copper to form an amalgam, and this is mixed with finely divided carbon or lubricating material, after which substantially all of the mercury is removed by applying heat and pressure. The patent was assigned by Samuel Trood to the Westinghous Electric & Mfg. Co.

Measuring Three-Phase Energy (1,281,399).—To meter three-phase current when the loads may be either balanced or unbalanced, Heinrich Landis (of Zug, Switzerland) uses two measuring systems for measuring the wattless component of the apparent power. Each of these systems includes means for producing a main field and a shunt field, the shunt field in the one being 30° in advance of the main field and in the other 30° behind the main field with a noninductive load.

Personal

Frank A. Ketcham Becomes General Sales Manager of Western Electric—H. L. Treeman Promoted—Changes

L. W. Brownrigg, formerly partner in the R. B. Randall Electric Co., Kansas City, Mo., is now connected with the National Carbon Co., Inc., of Cleveland.

T. D. MacMullen, formerly assistant manager of the Majestic Electric Development Co., has been appointed sales manager of the company with headquarters in San Francisco. He will also retain the direction of all his former duties.

J. W. Rahilly has taken a position as chief engineer of the power plant of the Illinois Traction System at Peoria, Ill. He has recently been engineer at the plant of the La Salle Portland Cement Co. at La Salle, Ill.

L. P. Lottridge, auditor of the Eastern Oregon Light & Power Co., Baker, Ore., for the past three years, was recently appointed manager to succeed the late Frank A. Harmon. Mr. Lottridge formerly acted as assistant manager to Mr. Harmon.

Henry L. Gray, formerly employed as an engineer by the State Public Service Commission of Washington, has become one of the experts checking the property of the Puget Sound Traction, Light & Power Co. in Seattle for the city. His portion of the work consists in endeavoring to disclose how much real estate owned by the company belongs to the power division and how much is strictly street car operating property.

George D. Bury, formerly connected with the Detroit Real Estate Board and for some time engaged in the electrical supply business in Cleveland, has been appointed secretary of the local Electrical Contractors' Association. Mr. Bury, together with the secretaryship, will also act as organizer of the Ohio Association of Electrical Contractors and Dealers, and will assist in perfecting arrangements for the state convention to be held Dec. 10 and 11.

H. L. Treeman has been promoted by the J. G. White Management Corporation, New York City, from industrial engineer of that organization to the position of manager of the electric department of the Eastern Pennsylvania Railways Co. and the Eastern Pennsylvania Light, Heat & Power Co., of Pottsville, Pa. Both of these utilities are operated by the management corporation. Mr. Treeman was graduated from the Oklahoma Agricultural & Mechanical College in 1909, with the degree of bachelor of science, having specialized in mechanical and electrical engineering. He is a member of Theta Xi fraternity. He was associated with the Edison Electric Illuminating Co. of Brooklyn as power engineer for a number of years. In 1915 he left the services of that company to accept the position of industrial engineer with the J. G. White Management Corporation.

Frank A. Ketcham has been appointed general sales manager of the Western Electric Co. with headquarters in New York, effective Dec. 1. On this work Mr. Ketcham takes the place of Gerard Swope, who is at present serving as assistant to General G. W. Goethals in the Division of Purchase, Stores and Traffic of the War Department. On his return from his war service, Mr. Swope will resume active charge of the export and foreign business of the company. Mr. Ketcham is a native of Michigan, having been born in Saginaw in 1875 and educated at the University of Michigan. He came with the company in 1900, starting at the Clinton street office in Chicago. During his entire career with the company he has been identified with the Chicago house in various capacities. Most of his early work was done in the telephone supply end of the business and in 1905 he became telephone storekeeper. A year later he was promoted to the position of chief clerk, and on Jan. 1,

Frank A. Ketcham.

1907, to that of assistant manager. In April, 1911, he was made manager and two months later received the additional title of central district manager, with supervision over the Cincinnati, Omaha, Indianapolis and Minneapolis houses and later of other branches.

Mr. Ketcham is another example of a Western Electric executive who has come up through the organization to a place of large responsibility. He combines an intimate knowledge of the business with rare executive ability and a wide personal acquaintance and popularity. Having been identified with the company's business in the middle West for 19 years, his departure from Chicago will be keenly felt by his many associates both in and outside of the business. Mr. Ketcham will take up his duties at New York about the first of the year. His successor as manager at Chicago has not yet been announced.

David F. Crawford, formerly designing engineer for the Lyons Atlas Co., Indianapolis, has accepted a similar position with the Midwest Engine Co., also of Indianapolis.

F. J. Jarosch, formerly chief engineer of the Bearings Co. of America at Lancaster, Pa., has become secretary and manager of the Liberty Engineering Co., Inc., of Lancaster.

Henry L. Doherty of New York City recently contributed an article to *American Magazine* on "Some of the Whys of Success and Failure,' which appears in the December issue. In his article, Mr. Doherty mentions the fact that he doesn't have an automobile. This is simply an astounding little fact mentioned in passing for its oddity, for Mr. Doherty controls over 200 big utility enterprises in addition to being the second largest producer of refinable oil in the world. In his article, which is written in a very interesting style, he gives some valuable pointers upon how a man should do his work in the interest of himself and his employer.

Arthur P. Good, chief inspector of the Commonwealth Edison Co., Chicago, was recently commissioned a captain in the Quartermaster's Department of the Army. Captain Good has been associated with the electrical industry of Chicago since 1901, when he entered the meter department of the Commonwealth Electric Co. Later, in 1908, when this company was absorbed by the Commonwealth Edison Co., he was appointed chief inspector of the latter company. In this capacity he exercised much influence for the betterment of wiring conditions and the high standard of electrical construction now required in Chicago is largely due to his efforts. He was a member of the Wiring Committee of the National Electric Light Association in 1917-18.

Obituary.

Lieut. George A. McKinlock, Jr., liason officer on the staff of Maj.-Gen. Beaumont B. Buck, American Expeditionary Forces in France and a son of George A. McKinlock, Sr., president of the Central Electric Co., Chicago, was killed in action recently, according to official reports. Before his enlistment Lieutenant McKinlock was associated with his father in the offices of the Central Electric Co.

Louis A. Heitmeier, manager of the Detroit office of the F. Bissell Co., Toledo, Ohio, jobber and manufacturer of electrical supplies and machinery, passed away after a short illness from pneumonia on Nov. 9. Burial was held from his home at Carlyle, Ill. Prior to joining the F. Bissell Co. Mr. Heitmeier was connected with the Wesco Supply Co., of St. Louis, Mo., and the McGraw Co., of Omaha, Neb. The deceased is survived by his widow.

After the War, What?

XIII.

Don't Jump at Conclusions

DON'T THINK THAT "THE BOYS IN FRANCE" WILL BE BACK ON THE NEXT BOAT.

It took two years to get them all there. It will take some time to bring them all back, and there will be a lot to do before any one of them comes back.

DON'T THINK THAT MAN-POWER WILL NO LONGER BE SCARCE.

Three million men are still out of industry. Government war work will continue at top speed for a long time, even after peace has been assured.

DON'T THINK THAT TRANSPORTATION WILL BE NORMAL.

The railroads all over the country will have more than they can do in transporting Government supplies, raw materials and essentials for a long time to come.

DON'T THINK THAT THERE WILL BE A GREATER STOCK FROM WHICH TO CHOOSE IMMEDIATELY—There is likely to be less before there is more. Many factories will never again make their pre-war products, others will not do so for some time to come; none will be able to turn out their product at lower prices until they can buy the raw materials for less and their other manufacturing costs diminish.

KEEP COOL and stick to your present connections in the trade. Cultivate "good-will;" prepare for the future.

C. A. Tupper, President . CHICAGO
INTERNATIONAL TRADE PRESS, Inc.

Financial News

Indiana Company Files Petition for Bond Issue.

The Interstate Public Service Co. has petitioned the Indiana Public Service Commission for permission to issue $203,000 of its 30-year 5% gold bonds, due Jan. 1, 1948, to be sold at not less than 75% of par; and to issue $29,500 preferred stock at par. The funds derived from the sale of the stock and bonds are to be applied to discharging the unsecured indebtedness incurred prior to last September, principally through the buying of and improvements to the Marion Light & Heat Co. and the Muncie Electric Light Co. The authorized capital stock of the company is $3,250,000, with $3,000,000 common stock and $207,700 preferred stock outstanding.

National Conduit & Cable Company Reports.

For the quarter ended Sept. 30 the National Conduit & Cable Co. shows a deficit of $483,380 after taxes, charges and depreciation of $356,532, as compared with a deficit of $102,055 in the last preceding quarter.

The estimated income for nine months ended Sept. 30, 1918, shows net sales of $10,790,010; manufacturing costs and expenses, $11,011,206; loss from operation, $221,196; other income, $66,356; total deficit, $154,841; taxes, charges and depreciation, $723,007; loss for nine months, $877,848.

According to the statement accompanying the report, "the company's munitions equipment has been sold and the unfinished balance of its cartridge contract has been canceled, so that losses from this source are ended."

American Light & Traction Earnings.

The American Light & Traction Co. reports for the quarter ended Sept. 30 last a decrease in net earnings as compared with the same quarter in 1917, based on actual operating results, of only $60,025, notwithstanding that during the quarter tax charges in the subsidiary companies were increased $90,000, while fuel and labor costs increased $234,600.

The report for 12 months ended Sept. 30 compares as follows:

	1918.	1917.
Gross earnings	$5,008,541	$5,397,951
Net earnings	4,704,769	5,028,779
Previous surplus	12,698,235	11,559,746
Total surplus	17,403,004	16,588,525
Total dividends	5,518,837	4,732,897
Final surplus	12,274,167	11,855,628

Niagara Falls Power Asks $2,000,000 Bond Issue.

Permission has been asked of the Upstate Public Service Commission by the Niagara Falls Power Co. to issue $2,000,000 bonds reserved under the refunding and improvement mortgage of the Hydraulic Power Co. of Niagara Falls, dated Oct. 1, 1916. The money is to be used to pay for property acquired and improvements in accordance with the expansion program of the company to enlarge its output. Improvements under way are estimated to cost about $4,000,000 and the money required to pay for this in excess of the proposed bond issue will be taken from the cash assets in the treasury.

Massachusetts Electric Increases Stock.

The Massachusetts Gas & Electric Light Commission has approved the petition of the Central Massachusetts Electric Co. for an increase in capital stock of the par value of $200,000 to pay for indebtedness incurred by extensions and betterments. The board approves that the new stock be offered at $105 per share.

Power and Gas Bonds Offered.

Taylor, Ewart & Co. are offering $450,000 of the Salina Light, Power & Gas. Co. first mortgage 6% gold bonds, maturing in a year and a half, at 97¾, netting 7.60%.

Dividends.

American Power & Light Co. has declared a quarterly dividend of 1%, payable Dec. 2 to stock of record Nov. 22.

Directors of the Cities Service Co. have declared the regular monthly dividend of ½% cash on the common shares and an extra dividend of 1% in stock. This is an increase of ¼% monthly in the stock dividend, and together with the cash dividend is equal to 18% on the common share if maintained for one year.

Eastern Wisconsin Electric Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Dec. 2 to stock of record Nov. 20.

Northern Texas Electric Co. has declared a dividend of $2 a share on common stock, payable Dec. 2 to stock of record Nov. 2.

Wisconsin-Minnesota Light & Power Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Dec. 2 to stock of record Nov. 20.

Baton Rouge Electric Co. has declared a semi-annual dividend of $4, also a semi-annual dividend on preferred stock of $3, both payable Dec. 2 to stock of record Nov. 20.

West Penn Traction & Water Power Co. has declared a quarterly dividend of 1½% on preferred stock, payable Dec. 16 to stock of record Dec. 2.

A dividend of $2 per share will be paid by the American Telephone & Telegraph Co. on Jan. 15, 1919, to stockholders of record Dec. 20.

WESTERN UNION TELEGRAPH.

For July—	
Gross revenue	$6,105,377
Operating income	1,167,905
For 6 months ended July 31—	
Gross revenue	41,664,905
Operating income	8,708,464

CONSOLIDATED GAS.

For the year ended June 30, 1918, Consolidated Gas, Electric Light & Power Co. of Baltimore reports surplus after taxes and charges of $1,157,565, equivalent to $8.04 a share on the stock, as compared with surplus of $1,446,421, or $10.05 a share, in the last preceding fiscal year.

MISSISSIPPI RIVER POWER CO.

For August—	1918.	1917.
Gross	$ 192,703	$ 173,467
Net	158,383	144,792
Surplus	37,872	22,856
12 months ending Aug. 31—		
Gross	2,156,539	1,899,217
Net	1,731,332	1,527,913
Surplus	282,596	215,832

UNITED RAILWAYS INVESTMENT CO.

The United Railways Investment Co., not including control companies, reports for the year ended June 30 last as follows:

	1918.	1917.
Income	$1,703,508	$1,891,583
Total expenses and charges	1,703,508	1,891,583
Previous surplus	7,055,715	6,949,015
Discount on bonds purchased for sinking fund	208,520	106,700
Profit and loss surplus	$7,264,235	$7,055,715

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid. Nov. 19.	Bid. Nov. 26.
Adirondack Electric Power of Glens Falls, common	6	12	14
Adirondack Electric Power of Glens Falls, preferred	6	..	69
American Gas & Electric of New York, common	10+extra	100	100
American Gas & Electric of New York, preferred	6	43	43
American Light & Traction of New York, common	..	237	238
American Light & Traction of New York, preferred	6	98	102
American Power & Light of New York, common	4	40	55
American Power & Light of New York, preferred	6	68	74
American Public Utilities of Grand Rapids, common	..	15	10
American Public Utilities of Grand Rapids, preferred	7	38	38
American Telephone & Telegraph of New York	..	105	104
American Water Works & Elec. of New York, common	..	7	7
American Water Works & Elec. of New York, particip	7	14	14
American Water Works & Elec. of New York, first preferred	..	68	65
Appalachian Power, common	..	2	2
Appalachian Power, preferred	7	18	10
Cities Service of New York, common	+extra	293	296
Cities Service of New York, preferred	6	81	82
Commonwealth Edison of Chicago	8	118	118
Comm. Power, Railway & Light of Jackson, common	..	26	23½
Comm. Power, Railway & Light of Jackson, preferred	6	51	51
Federal Light & Traction of New York, common	..	7¼	9
Federal Light & Traction of New York, preferred	..	35	39
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	27	27
Middle West Utilities of Chicago, preferred	6	54	57
Northern States Power of Chicago, common	..	62	64
Northern States Power of Chicago, preferred	ex.div.7	87	86½
Pacific Gas & Electric of San Francisco, common	..	41	40
Pacific Gas & Electric of San Francisco, preferred	6	84	84
Public Service of Northern Illinois, Chicago, common	7	92	95
Public Service of Northern Illinois, Chicago, preferred	6	85	88
Republic Railway & Light of Youngstown, common	4	18	18½
Republic Railway & Light of Youngstown, preferred	6	57	57
Standard Gas & Electric of Chicago, common	..	10	10
Standard Gas & Electric of Chicago, preferred	6	31	33
Tennessee Railway, Light & Power of Chattanooga, common	..	3¼	3¼
Tennessee Railway, Light & Power of Chattanooga, preferred	6	16	16
United Light & Railways of Grand Rapids, common	4	41	39
United Light & Railways of Grand Rapids, preferred	6	74	72
Western Power of San Francisco, common	..	13	14
Western Power of San Francisco, preferred	6	59	60½
Western Union Telegraph of New York	extra	91	87
Industrials—			
Electric Storage of Philadelphia, common	4	53	51
General Electric of Schenectady	8	152	148
Westinghouse Electric & Mfg. of Pittsburgh, common	7	43½	42
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	61	60